Vol 3 No 4 UK £1

COMMODORE

COMPUTING INTERNATIONAL

The Independent Commodore Magazine

IN THIS 96 PAGE ISSUE

Around Sound - Special Features

Commodore Makes Music

32 page Games Supplement

PLUS

News · Reviews · Listings

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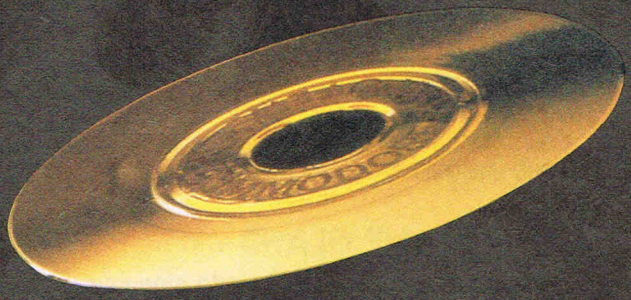

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The tough nuts to crack!

Braingames bring you the most entertaining and fulfilling adventure and strategy games.

Our adventures combine strong story lines, high quality graphics and sound, to produce games you will want to play time after time.

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For the Commodore 64

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FLAME ISLAND

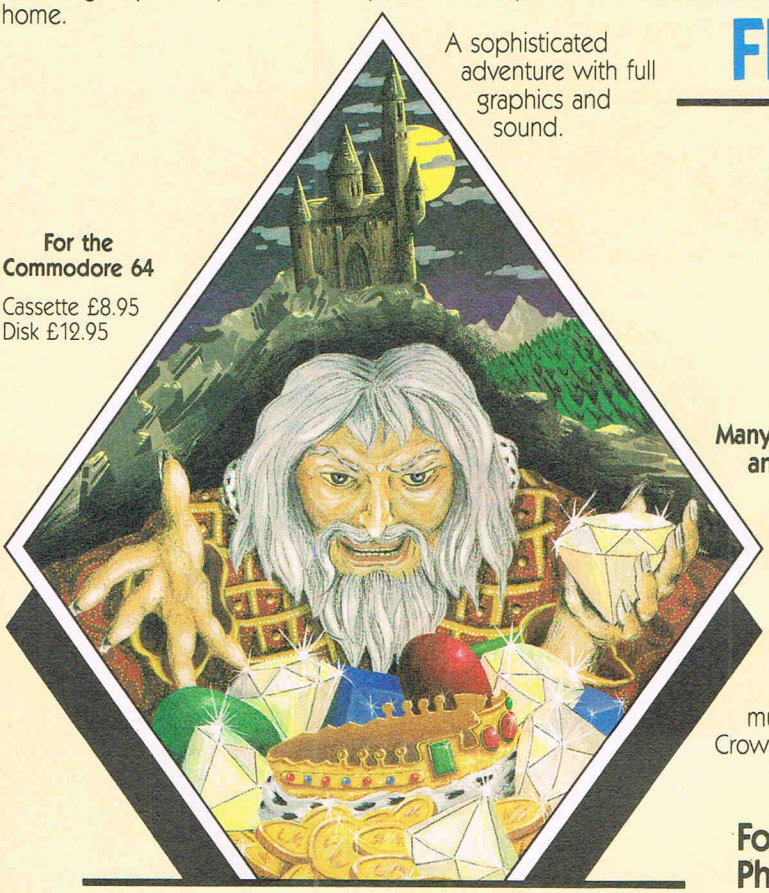
Throughout the seaports of the old world a rumour has spread – the monks of Flame Island have found the fabled Emerald of Power.

The origin of the Emerald is lost in the mists of time, however the stories suggest that it has esoteric powers of a mystical nature. It is suggested that the monks have placed the Emerald on a dias deep within their temple and have laid many devious traps to protect it.

Landing at the harbour of Flame Island, you must find the temple and retrieve the Emerald of Power. In order to escape safely, you must signal your ship to return to port and safely embark for home.

A sophisticated adventure with full graphics and sound.

FLAME ISLAND



For the Commodore 64

Cassette £8.95
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CASTLE FEAR

Many centuries ago, the evil wizard stole the Golden Crown and the seven Diamonds of the Ancient Kings.

He has hidden them deep within his stronghold, Castle Fear, where there are many mystical creatures to guard them. It is rumoured that the wizard himself keeps the Golden Crown, and that he has given the Seven Diamonds to his servants of evil. Over the years, certain brave adventurers have penetrated the Castle, but none have ever returned.

To win the hand in marriage of the Princess, you must dare the evils of Castle Fear and return with the Golden Crown and the Seven Diamonds of the Ancient Kings.

A sophisticated adventure with full graphics and sound

CASTLE FEAR

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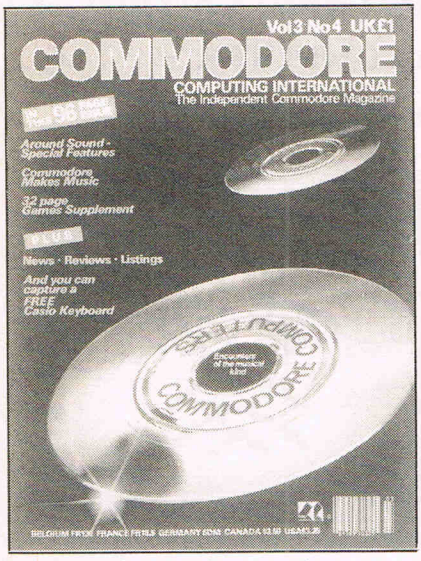
COMMODORE COMPUTING INTERNATIONAL

OCTOBER 1984

COVER STORY



Our theme this month is sound – an era in which interesting possibilities are arising for the home computer owner.

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NEXT MONTH

CCI takes a look at the business end of the market next month with reviews of hardware and software, plus opinions from key Commodore executives.

First, a question.

Who do you think are the world's most avid consumers of microcomputers?

The ingenious Japanese? The fashionable French? The acquisitive Americans?

Believe it or not, it's we British who own more micros per person than any other nation on earth.

Yet, despite its amazing impact, the microcomputer has only just begun to scratch at the surface of our lives. Without doubt, the best is yet to come.

Use and Abuse.

In several recent surveys, some astonishing facts about micro use and abuse were revealed.

It was discovered that the micro is hopelessly under-utilised. If you're already a micro owner, your own experience may well confirm this unhappy state of affairs.

Brainpower. A source of knowledge.

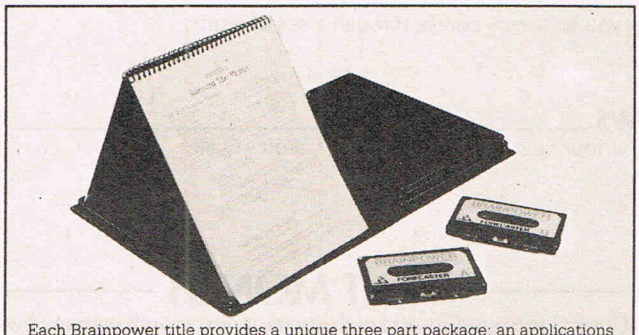
For thousands of years, the key to self improvement has been in the hands of the written word. Now, thanks to the Brainpower range, it's very much in the hands of the micro.

As the Brainpower range demonstrates, this does not require prior knowledge of micros, or how they work.

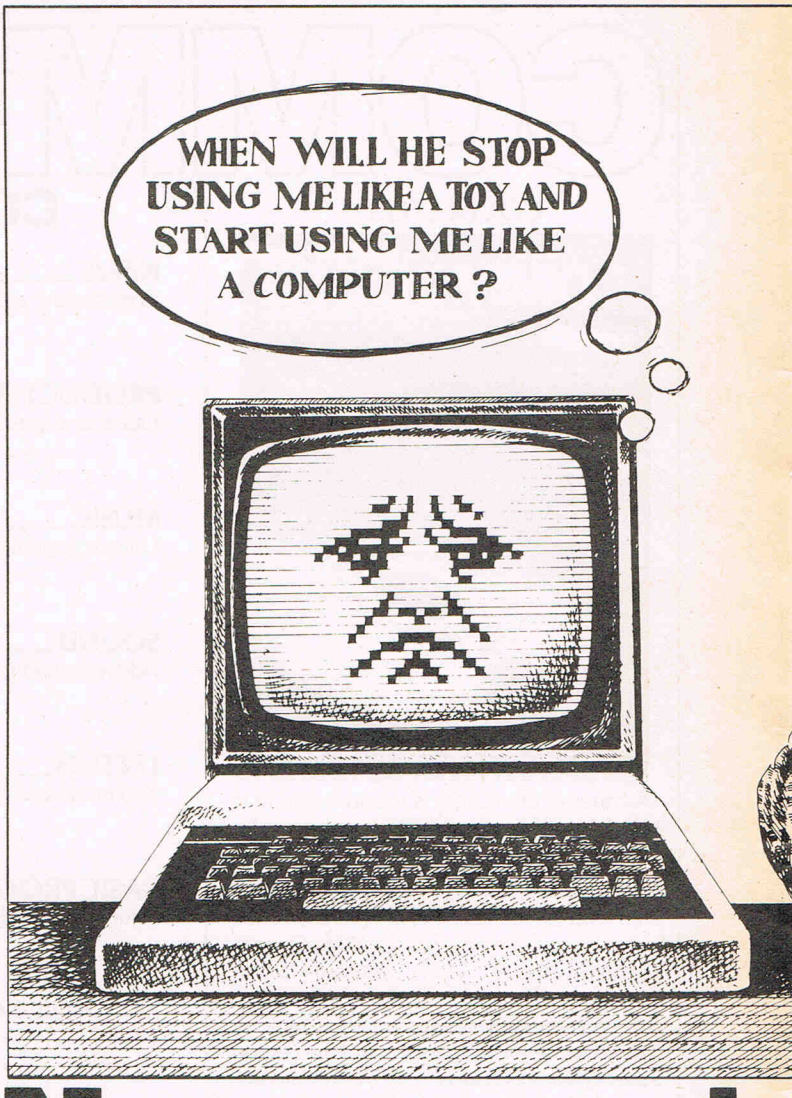
The Brainpower concept has been devised as *integrated* applications and educational software. And its aim is to stretch both your mind and your imagination.

It offers a unique way to realise your own full potential and that of your micro. In a way you could never hope to achieve from the printed word alone.

In this respect, the Brainpower range stands on its own.



Each Brainpower title provides a unique three part package: an applications program, a teaching program and an illustrated manual and interactive tutorial – integrated applications and educational software.

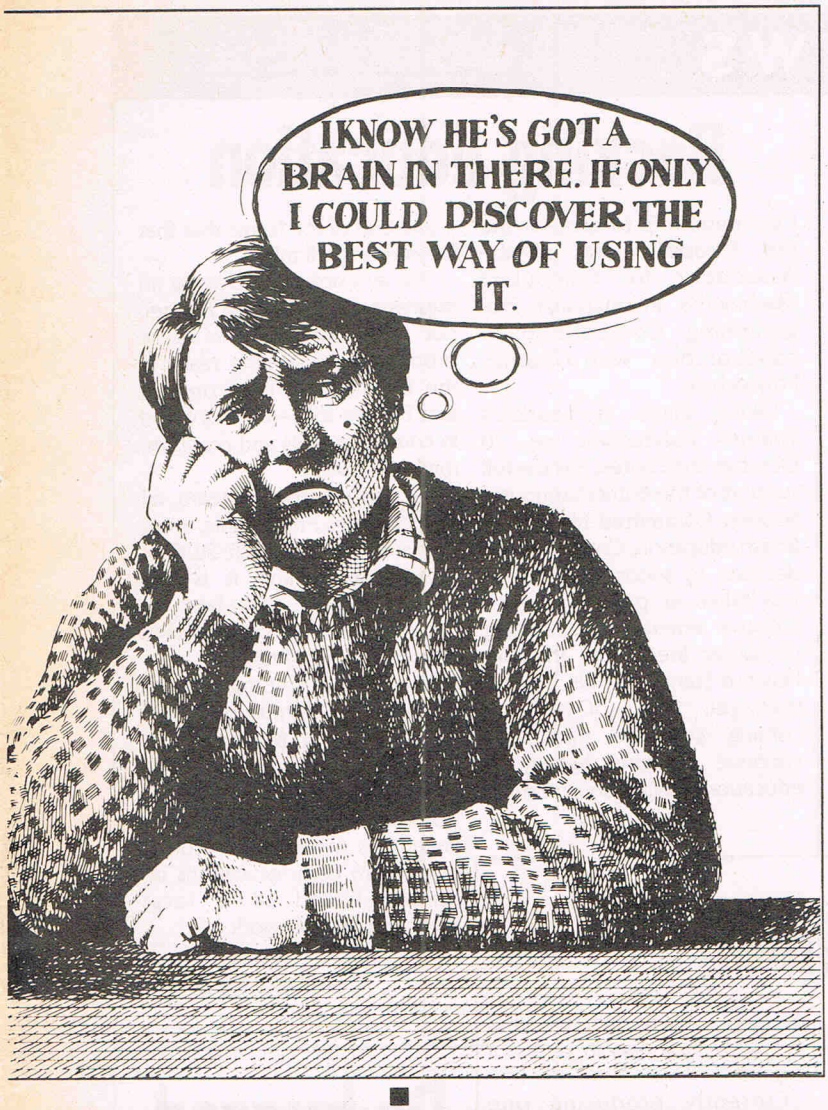


Now you and y bring out the be

A unique concept.

All the Brainpower titles share one thing in common, apart from their stimulating subject matter, that makes them unique.

You will find each title comprises three distinctive elements: A teaching program that helps you to get to grips



your micro can est in each other.

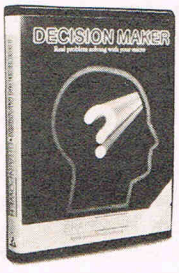
with the subject at your own pace. An applications program to put what you learn into action. And finally, with each package, you get an expertly written book and interactive tutorial.

STAR WATCHER

The secrets of the heavens are yours. Isolate all the constellations as well as main stars for easy identification. Even turn stars and constellations on and off at will. Screen by screen, you will see exactly how the 1,500 brightest stars move through time and space. And all from any point on the Earth's surface at any time of the year.

Star Watcher is without doubt the definitive home observatory.

DECISION MAKER



Should you buy a new house? Change jobs? Have children? Start your own business? Such decisions should not be taken lightly. Armed with Decision Maker, you can be quite sure of examining every avenue, and arriving at a rational, structured answer.

If you value the way you run your life, you need Decision Maker.

NUMBERS AT WORK

Tackle all the number problems you're likely to face in daily and business life. From straightforward multiplication and division of fractions, through decimals, percentages, ratios, mark-ups and margins to compound interest, depreciation, VAT and PAYE.

Numbers at Work gives you a distinct edge, since you will be able to both understand and manipulate numbers at will.

PROJECT PLANNER

Project Planner teaches you how to divide even the most complex project down into meaningful components. Learn how to determine the length and importance of every single task, and those elements critical to the fulfilment of your plan. Even anticipate problems you hadn't envisaged.

You have the measure of any situation because you have the fullest possible grasp of all the factors which affect it.

FORECASTER

Forecaster takes the guesswork out of forecasting, by accepting that tomorrow's events will be best predicted on the basis of today's facts. Armed with Forecaster, sales targets and growth trends, even sporting events and election results can be accurately and very quickly predicted.

Invaluable to you in both your private and business life.

ENTREPRENEUR

Entrepreneur teaches you all the steps required to plan and start your own business. It will forecast your first 18 months' cash flows, generate your Profit and Loss Account and Balance Sheet. Help you in discussions with your bank manager and partners. Explain the notions of assets, liabilities, overheads, working capital, cash flow and break even point.

Invaluable to anyone who is planning a business venture.

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Numbers at Work		N/A	N/A		
Star Watcher		N/A	N/A	N/A	N/A
Entrepreneur		N/A	N/A		
Project Planner	N/A				
Forecaster	N/A				

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BRAINPOWER

Commodore buy Amiga

Commodore look set to start a war with Apple with their purchase of Amiga – a home computer using the same MC68000 chip as the Macintosh and, it is claimed, matching the high-quality graphics of the Apple box.

Commodore recently purchased Amiga, the tiny privately-held outfit, to the pique of former Commodore boss Jack Tramiel who also wanted the Amiga for his new company, Atari, bought from Warner Communications.

In fact Tramiel and Atari are suing Amiga over the fraud of three chips which they say were commissioned by Atari to design, when Atari was still owned by Warner Communi cations.

Likely specifications of the Amiga are a 128Kb CPU, expandable to 256Kb; one 5.25 inch 360Kb floppy drive, built in modem, and optional hard disk. This is Amiga's own spec and Commodore have the option to change it.

Both Commodore and Atari are working to produce a machine to compete with the Apple Macintosh, but at a lower price.

A figure that has been quoted for the Amiga is under $1000 (£775). Some reports say that Commodore are to launch the Amiga next month. However, Howard Stanworth, Com modore's UK general manager, says: "Precisely what form the machine will be marketed in is still being decided".

Backing education

Commodore is to sponsor the first European Heat of the Association for Computing Machinery's International Programming Competition in collaboration with Thames Polytechnic.

Taking place at London's Thames Polytechnic on 20 October, the contest has the full support of the British Computer Society. Committed to backing British education, Commodore's decision to sponsor the event was taken as part of a major initiative aimed at encouraging computer literacy in the UK. Howard Stanworth, UK general manager, says: "Over the coming year we intend to continue investing heavily in education in this country and this is just one of the forms that that investment will take.

"We aim not only to stage an impressive contest in October, but also hope that the event produces the winning team in the International final, proving that Europe still leads the world in computer skills and programming creativity."

Last year's European team, all from Thames Polytechnic, went on to form the British Student ACM chapter and it is this chapter which will host in October the first ever European Heat of the competition.

Teams are set six programming problems which must be solved in the shortest possible time. Solutions can be programmed in either Pascal or Fortran using Commodore 8000 computers linked by means of a Cortex Intercomm communications interface linked to a local minicomputer network.

CBM make a million

Commodore recently celebrated the production of the millionth Commodore computer to be manufactured in Corby since the temporary factory opened 15 months ago.

Brandishing the 64 in question at a recent press conference Howard Stanworth, Commodore UK's general manager, said: "This Commodore 64 is very special to us. It not only symbolises an unprecedented success story for us since it is the best-selling home computer in the world, but it says a great deal about Commodore's growing contribution to Britain in terms of jobs, both directly and indirectly, and also in terms of export".

Currently producing one home computer every five seconds, Commodore say that this rate will double when production is up to full capacity.

At this point we must apologise for the gremlins that found their way into a news story in last month's CCI which stated that Commodore were producing 2,000 computers a month. This should, of course, have read every week. Otherwise it would be a couple of years yet before Commodore could have celebrated their millionth computer produced in Corby! Sorry.

Both the C16 and Plus/4 will also be manufactured in Corby. Both have also suffered a price increase since first announced. The C16, which is being sold as a complete starter pack, retails at £133.99, while the Plus/4 is up to £299.99. Stanworth blamed these price increases on the changing rate of the American dollar.

De-bugged 64

A couple of interesting snippets for anyone who has bought one of the 64's manufactured in Corby. commodore have made a couple of (unannounced) changes.

In the old 64's there was a bug in screen editing due to the linking of lines. When you wanted to make a character appear on the screen by POKEing, you would have to POKE to screen memory, plus colour into colour memory, before the character would appear. Modifications have been made to the Kernal of the machine and now all you need to do is POKE to screen and the character will appear straight away.

The 64 sounds off

Learn the fundamentals of music or transform your 64 into a synthesiser and create musical compositions

The sound capabilities of the 64 are already above average for the home computer. Now there are numerous music packages available catering from the beginner to the advanced musician.

There are programs to teach the fundamentals of music; to experiment with different sounds, tempos and rythmic styles; to transform the 64 into a synthesiser; to enable programmers to create tunes and even copy sheet music directly by writing notes on the staves.

We have picked a selection of music programs to give you an idea of what is available on the market.

MUSICALC TEMPLATES

These templates can be used to extend the bumber of pre-recorded tunes on Musicalc 1. Thirty-two scores and sounds can be used in any combination as a basis for compositions. By using the slider controls with templates, sounds and timing can be altered.

Templates currently available include Latin/American rythms, New Wave/Rock and the Beat File, which contains a set of drum rythms.

Each disk costs £15.

Contact: Musicalc UK, Paradox Group, The Metrolpolitan, Enfield Road, London N1. Tel: 01 241 2448.

MULTISOUND

A musical synthesiser program enabling a wide variety of sounds to be created – musical instruments such as piano, violin and flutes and special effects. The 64 can be used as a musical keyboard or to compose tunes which can be saved on tape. Eight full octaves can be utilised and a visual display provides feedback on play as well as individual notes to be entered in preset mode. Background drum rhythms can also be used. Available on cassette for £14.99.

Contact: Romik, 272 Argyll Avenue, Slough, Berks. Tel: 75 71535.

MUSICALC 3

The 64's keyboard can be customised to play scales. Eighty present scales are provided with the package. Scales can be transposed, combined, and moved on Musicalc 3. The program operates with Musicalc 1 as well as independently. Disks retails at £31.

Contact: Musicalc UK, Paradox Group, The Metropolitan, Enfield Road, London N1. Tel: 01 241 2448.

MUSICALC 1

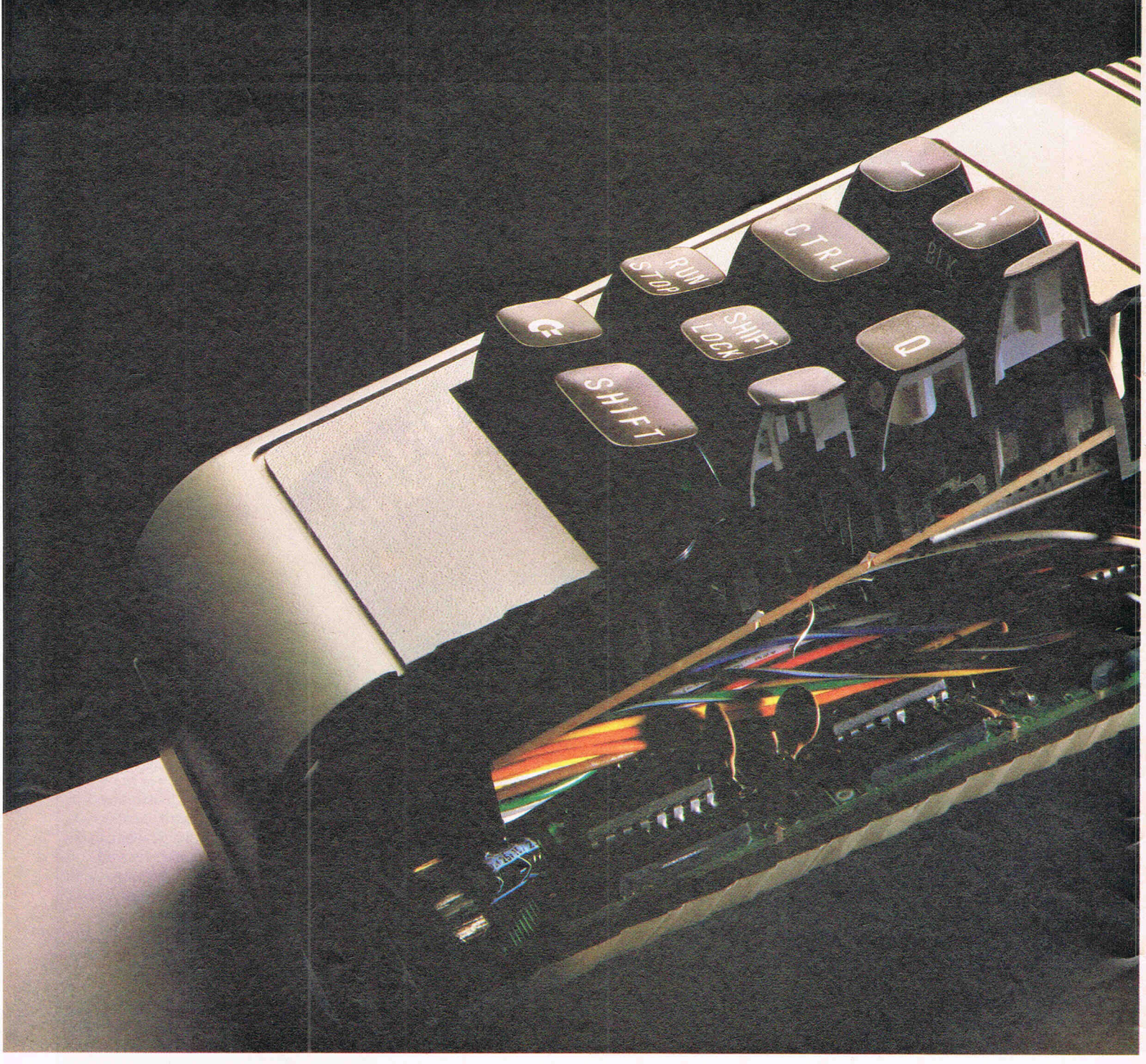
A three-voiced music synthesiser with slider controls, modulators, transposers, a score composition panel and step sequencer. Thirty-two pre-programmed melodies can be played. In addition personal compositions can be performed in styles ranging from Classical to New Wave and stored for later playback. Disk costs £45.

Contact: Musicalc UK, Paradox Group, The Metropolitan, Enfield Road, London N1. Tel: 01 241 2448.

MUSICALC 2

Operates with Musicalc 1 to print out compositions in standard music notation. No knowledge of musical notes is necessary. It also improves Musicalc's facility by allowing compositions to link 32 scores up in various combinations. Musicalc 2 will also enable Musicalc 1 to be linked to electronic instruments such as Drum machines and keyboards. Disk retails at £31.

Contact: Musicalc UK, Paradox Group, The Metropolitan, Enfield Road, London N1. Tel: 01 241 2448.



Are you only using

To only play games on a Commodore computer is like asking Albert Einstein to work out the square root of four.

The computer's brain barely ticks over.

To really stretch it, you need more interesting software programs. For example, record keeping, interactive education, stimulating adventure games or word processing.

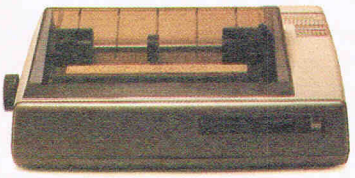
And for those you need peripherals.

Like a Commodore disk drive, a really fast storage and retrieval system with a vast memory.

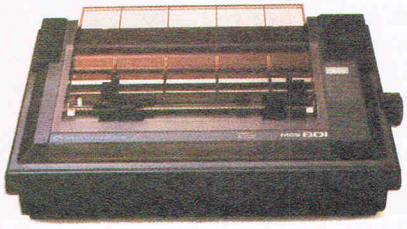
Or a Commodore cassette unit, the inexpensive way of loading and storing programs.

For those who like the idea of text and graphics being more alive and having greater clarity than on a TV, there's the Commodore colour monitor.

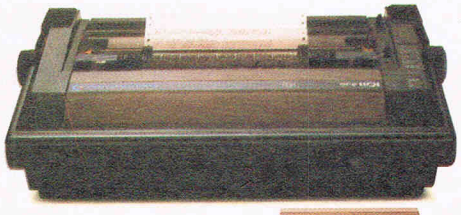
COMMODORE MPS801 ☐
Dot matrix printer. £230.00.
Tractor feed. Print speed:
50 characters per second.



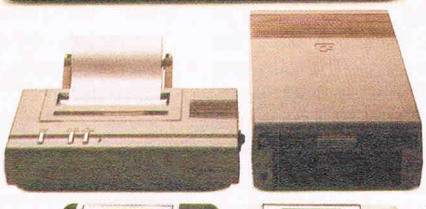
COMMODORE MPS802 ☐
Dot matrix printer. £345.00.
Friction feed for standard
paper. Print speed:
60 characters per second.



COMMODORE MCS801 ☐
Dot matrix colour printer.
£399.99. 7 colours including
black. Print speed:
38 characters per second.



COMMODORE DPS1101 ☐
Daisy wheel printer. £399.99.
Letter quality print on
standard paper. Print speed:
18 characters per second.



COMMODORE 1520 ☐
Printer plotter. £169.99. For
charts and graphs. Print speed:
14 characters per second.

COMMODORE 1541 ☐
Disk drive. £229.00.
170K memory. 5¼" diskette.

COMMODORE 1531 ☐
Cassette unit. For Commodore
16 and Commodore plus/4.

COMMODORE 1530 ☐
For Commodore 64.
£44.95 each.

COMMODORE 1701 ☐
Colour monitor. £230.00.

JOYSTICKS ☐
(prices from £7.50)

PADDLES (£13.50). ☐

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And for hard copy, there are our four printers and a printer plotter. These will preserve on paper–in colour, black and white, chart form, graphs or text, the fruits of all your labour.

Finally, for more exciting games, there are joysticks and paddles.

So use your brain. And make sure you use all of your computer's brain.

FOR FURTHER INFORMATION, TICK ONE (OR MORE) OF THE BOXES ABOVE AND SEND TO THE COMMODORE INFORMATION CENTRE, 1 HUNTERS ROAD, WELDON, CORBY, NORTHAMPTON NN17 1QX. TEL: CORBY (0536) 205252.

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commodore

PRODUCT SURVEY

MUSIC MASTER

A programmable synthesiser with an automatic rhythm and sequencing capabilities. It contains 34 pre-programmed rhythms and patterns and two further rhythms can be composed by user. An edit and playback facility provides a means to entering and playing three part music scores. Two to three recordings can be played back at a wide range of tempos. Program also includes graphical displays of keyboards and music 'staves. It retails on cassette for £17.95 and on disk for £19.95.

Contact: Supersoft, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex. Tel: 01 861 1166.

DANCING FEATS

A program enabling programmers to experiment with different sounds, tempos and rythmic styles. It is menu-driven and the programmer is confronted with a choice of Bass, Beat, Style and Tempo. If Bass, the lowest note in music, is chosen the following musical styles can be used – Jazz, Rock, Blues and Boogie Woogie. Musical compositions can be created with the various sounds and saved. Retails at £6.95 on cassette.

Contact: Artic, Main Street, Brandesburton, Driffield. Tel: 0401 43553.

ULTISYNTH 64

Ultisynth enables the 64 to operate as a musical synthesesiser. Various musical sounds for instance the piano, violin, woodwind, drums or cymbals can be played along with the programmers own or any of the six preset rhythms. Sound effects such as explosions, birdsong and trains can be included in programs. Other features include four waveforms, synchronization, recording and editing facilities. Two user defined rhythms can be created. Retails at 14.95

Contact: Quicksilva, 13 Palmerstone Road, Southampton. Tel: 0703 20169.

GRAPHICS BASIC

Primarily a program enhancing the 64's BASIC with additional commands to create complex graphics, sprites and animation with easily understandable English commands, the program also features similar facilities for sound. It can generate three voices with automated background sound, four waveforms and four envelope shaping controls. Graphics Basic requires a joystick and retails at £27.95 on disk.

Contact: Hesware, Thorn EMI, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333.

SYNTHY 64

Music and sound synthesiser for the 64. Enables programmers to create music and sounds by adding a set of powerful commands to BASIC. Three voices can be played simultaneously over a range of eight octaves and in addition the character of each voice can be varied. Instrumental sounds such as piano, banjo and drum can be synthesised as well as special effects varying from chimes to wah-wah. Sample compositions are included on the program which is available on disk and retails at £14.95.

Contact: Adamsoft, 18 Norwich Avenue, Rochdale, Lancs. Tel: 0706 5244304.

MUSICOM

The Casio MR-200 when inter-faced to the 64 can either be programmed with a BASIC program, (a slow, but effective method) or used with Musicom, a music editor approved by Casio. It enables the user to produce a very wide range of performances ranging from single note melodies with auto-accompaniment to eight note polyphonic keyboard virtuoso arrangements from original music scores. the program also has editing control facilities and built in timing checks. Music can be stored on cassette. Retails at £9.95 on cassette.

Contact: Micro Musical, 37 Wood Lane, Shilton, Coventry. Tel: 0203 616760

THE COMPOSER 64

This music composer/synthesiser creates tunes and also allows sheet music to be copied directly by writing notes on the staves. The pre-programmed instruments in the program include woodwind, organ, guitar and harpsichord. Other features such as three voices, 15 range octave, four combinable wave forms, tempo control can be used to create compositions which can then be stored. It is available on cassette for £8.95 and on disk for £10.95.

Contact: Vulcan Computing Dept (C2), 32 Guildford Road, Farnham, Surrey. Tel: 0252 724182.

SYNTHESOUND

Transform the 64 into a music synthesiser. Various sounds and special effects can be created such as Bagpipes, Flutes, outer space panic, chirping birds. Solo and accompaniment keyboards are provided on the program. Features include a real time clock, eight waveforms, four envelope shaping controls, three voices and eight filter modes and 256 pitches or presets can be stored. Retails at £27.95 on disk.

Contact: Hesware, Thorn EMI, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333.

BRAVO

An introductory music program for beginners, Bravo teaches the fundamentals of music in six sections. Note Tutor and Symbol Tutor present the treble clef, pitch names and different note lengths. Name the Notes and Play the Songs are games ultilising knowledge gained in other sections. Free Play teaches you pitch in relation to the 64's keyboard and Mini-Composer puts everything together enabling melodies to be played with various instrumental sounds. Requires a joystick. Costs £22.95 on disk.

Contact: Hesware, Thorn ECI, Thomson House, 296 Farnborough Road, Farnborough, Hants. Tel: 0252 543333.

Computer conversation

"Argle bargle muffled moof" – speech synthesis at its worst! Electronic speech is not always BBC English, but Sally Wood was pleasantly surprised at the quality of some of the Spech Synthesisers currently on the market for the 64 and VIC 20.

Artificial speech has interested people ever since the Victorian days when they attempted to simulate speech by operating models of the human vocal tract by hand. Home computer owners now face a bewildering variety of speech synthesisers of an equally confusing range of prices and quality to choose from.

The recent phenomena of home computer owning households and the mass production of special chips designed for speech synthesis has prompted many of the companies to develop them.

There are two types of speech synthesiser, those utilising a library of sounds, the Phenome system or the digitisers.

Research into language has found that there are a number of phenomes or groups of sounds making up a language. These sounds, known as allophones, can be programmed onto a chip together with the means to link them up to create words. An almost infinite vocabulary can be created.

There seems to be a number of different types in this group. The more cumbersome synthesisers have to be programmed by PEEKing and POKEing the values into memory.

The text to speech synthesiser is becoming increasingly popular. Words typed straight into the computer are repeated out loud.

The disadvantage of the phenome system is that the voice sounds like a cross between a drowning man and Doctor Who's Daleks, although, to be fair, most words can be understood if you listen carefully.

Digitisers sound more human because the human voice is pre recorded and burned into the speech chip. The disadvantages are that only about 200 words can be stored and they have to be predetermined. There is not so much potential for the peripheral market, but they have a bright future in other areas of speech synthesis, for example education.

The human voice covers a wide range of frequencies – high pitched to low and deep and home computer synthesisers cannot hope to emulate this range. Speech 64 from Currah does have four voice intonations and in some applications, the voice tone used can be vital. A fairly deep male voice is preferred for business and home applications whereas in the Military services, a womans voice is preferred because the experts reckon that lonely young fighter pilots and ship's navigators will pay more attention!

In the past year, software companies have started to incorporate speech into their games. Interceptor's Tales of the Arabian Knights and Bug Byte's Twin Kingdom Valley, both include speech, but not in a very active way. Lines of text are merely repeating text already on the screen.

Rod Holland, Sales Manager of Currah forsees a great future for speech synthesis especially in the games and education field. Most games at the moment utilise sound and Gyruss from Parker Software is one of the best examples. Bach's Tocatta and Fugue in D Minor contribute a lot to the excitement and enjoyment of the game.

Perhaps in the near future speech will also become an integral part of a game or a program.

Currah have generated some interest among games manufacturers with their unit and in the next few months more and more programs are going to include speech in a much more interactive way than previously. Anirog's new game PC Fuzz utilises speech actively. Adventure games hold numerous possibilities for speech. Evil wizards, cunning creatures and strange voices could pose crucial questions or boom out commands which if not answered correctly or followed would result in disaster for the player.

Apart from the comparatively frivolous games world, numerous exciting possibilities exist in education. In particular reading and spelling for children and in computer assisted learning programs for the blind, partially sighted and mentally handicapped where printed displays are inappropriate.

A speech program which says letters and words as it is written, may help with spelling or pronounciation in reading. Blind or partially sighted people could perhaps learn to touch type as each key pressed would say a letter and help mistakes to be corrected.

Business and commerce also hold opportunities for speech synthesis. Washing machines fitted with a self diagnostic mechanism would save the housewife pounds. If anything went wrong the machine could actually tell the housewife what it is; your fanbelt has snapped or the pipe is blocked, thus saving a service bill. Already some cars use speech to inform occupants that their lights are on or the seatbelts aren't properly locked. The 64's timing mechanism could be utilised with a speech synthesiser to say 'wake up' in the morning – an effective alarm, although it can't make tea yet – yet! Speech synthesis could also be used in burglar proofing a house. Linking a unit up to the windows and doors could be triggered off by any forced entries and a 'stop thief' mechanism activated.

The possibilities are numerous and in the next few years the speech synthesiser potential may be developed to the full. Hopefully we have prompted your imagination and perhaps speech would add an extra dimension to your programming.

Speech Synthesisers for the 64 and VIC 20 are still in the games peripheral stage, but I think that will change.

PRODUCT SURVEY

SPEECH 64

The most important test for any device purporting to be a speech synthesiser is, of course, whether it actually does speak. Anything can mumble and squawk, but if you can actually understand what the computer is saying, then the device has passed its first qualifying test.

Speech 64 passed with flying colours and although some words sounded a bit obscure, for instance "ragged", the majority of words were perfect, albeit slightly inhuman.

The device is small and black and plugs into the cartridge expansion port at the back of the 64. The attached DIN plug fits snugly into the Audio/video socket. Absolutely nothing to it and operating it is even easier.

All that is necessary to get the computer talking is to tap INIT (+ RETURN) on the keys and it's ready to go. From then on, every single character that is typed in is repeated. There are four voice intonations although they are on the deep side.

To get the 64 to say a whole sentence, SAY is typed at the beginning of the line and the sentence is enclosed with speech marks: SAY "a long sentence" (+ RETURN).

Speech 64 is a text to speech synthesiser, but it uses the allophone system so not all words can be typed in as they are spelt. The English language is full of quirky pronounciations and spellings. For instance "sew" and "few" look the same, but sound completely different. Currah have included 58 speech sounds and four pauses and these can imitate most English words.

A system of square and round brackets are used to help the computer distinguish between single allophone sounds in a word. Allophonic words can be mixed with normal text. For example: SAY "I come from [haw(ii)(e)]" which when said would be "I come from Hawaii".

A speech buffer holds up to 25 seconds worth of speech and is extremely useful when you want the 64 to repeat long sentences. Incorporating the speech into your own programs – in both Machine Code and Basic is quite easy especially if you follow the manual instructions carefully. The sample program – The Speaking Clock may be a help.

The manual is excellent and has lists of allophones, pronounciations and deals clearly and concisely with the Speech 64 operation.

Currah hope that people will use it in serious programming rather than just a gimmick. It is certainly not a gimmick and I felt very impressed with it.

Product Name:
Speech 64
Product:
Speech Synthesiser
Company:
Currah Computer Components Ltd, Hollymount, Wooler Road, Hartlepool, Cleveland. Tel: 0429 34511
Hardware Requirements:
CBM 64
Applications:
Pure fun, can be used in programs, in educational games
Documentation:
Extremely clear and concise manual
Price:
£29.95

CHATTERBOX

Chatterbox has quite a history behind it. Currah designed it and Adman Electronics marketed it under a different name – Speech Synthesiser for the VIC 20. Currah are now back to selling it themselves under its former title – Chatterbox!

As the same company designed both synthesisers, Chatterbox and Speech 64 bear many similarities in operation, although the latter is a much improved version.

The device is creamy coloured and has an amusing picture of two Jack in the Boxes on its front. Connecting it to the VIC is easy. The unit plugs into the expansion slot and has two connector leads. One fits into the TV modulator plug and the other 5 pin DIN plug attaches to the displaced TV modulator plug.

Once in, it is ready to be programmed to speak immediately. It doesn't have a text to speech function and every word has to be typed in as it sounds using the allophones. Strings of words have to be followed by a SYS command and sentences of over 30 allophones will need more than one of these SYS commands.

I'm afraid that having been spoilt with Speech 64, Chatterbox just seems to be cumbersome to program.

However it is about the only speech synthesis device for VIC 20 owners and will have to do for the while. Actually the speech is quite good and the manual is very detailed in its explanation of allophones and gives numerous useful charts and lists.

Chatterbox can still chatter and although it has been upstaged by Speech 64, it is still a good product.

Product Name:
Chatterbox
Product:
Speech Synthesiser
Company:
Currah Computer Components Ltd, Hollymount, Wooler Road, Hartlepool, Cleveland. Tel: 0429 34511
Hardware Requirements:
VIC 20
Applications:
Making the computer talk
Documentation:
Excellent manual with sample program, clearly laid out information
Price:
£19.95

JCB MICROSYSTEMS

A vocabulary of 200 pre-defined words is one of the features of the new JCB Microsystems Speech Synthesiser that allows the user to create whole sentences when the words are combined with the allophones.

The unit has text and numeric capability, the latter of which includes exponential forms. And you won't have trouble understanding the JCB – it speaks proper English for numeric as well as textual expressions. For example, the computer will say the number 10,246 as ten thousand two hundred forty-six rather than merely saying each numeral in the number group.

When it is speaking text, the synthesiser has the ability to say up to 40 words with one command and pauses can be inserted to give the effect of a comma in a written sentence.

The package, which retails for £29.95, allows the user to intermix speech with any graphics that are on the screen without interrupting the speech. In case of a mistake, special error messages flash up giving more detailed information rather than simply flashing the ambiguous "syntax error".

The synthesiser cartridge plugs into the back of the Commodore 64 and comes with a detailed user manual.

Contact: JCB Microsystems, 29 Southbourne Road, Bournemouth, Dorset BH6 5AE. Tel: 0202 25417.

COMMTALK

The Commodore VIC 20 hasn't been neglected in the speech synthesiser market. The irish company Andor has come out with a cassette form synthesiser compatible with the Commodore 64 as well as the VIC 20.

Commtalk has no pre-set vocabulary, but a spokesman for Andor says the possibility of vocabulary is infinite because the allaphones are used to form words. The system utilizes a standard voice although it can be varied (to sound gruff, for example) by adjusting the frequencies using the Commodore's sophisticated SID chip. Once again, graphic displays on the screen will not interrupt the speech mechanism.

Including a large manual, it retails for £29.

By the way, Andor says they will be coming out with a more sophisticated unit by the beginning of 1985 that a spokesman says will be totally different from the Commtalk and designed for professional use (as well as the professional wallet).

Contact: Andor, 28 Hillside Drive, Rathfarnham, Dublin 14, Ireland. Tel: 0001 900 107.

PRODUCT SURVEY

MICRO COMMAND

Micro Command is not a speech synthesiser in the technical sense. It is a device which is taught to recognise the programmer's voice and then used to control the 64. In other words it is a voice recognition unit.

The Micro Command device plugs into the back of the 64 and operates with an accompanying cassette. This cassette contains eleven files; micro, logo, header, men, games, subrs, sheeptalk, symbols, teach, sheeptalk and symbols.

The first program, micro, is designed to introduce speech recognition. Micro Command has to be taught to recognise what the user's voice sounds like. "Up" and "down" are the first words it is taught. A little man will walk up and down a ladder on your command – if it has understood. It takes time for the recognition process and Orien have used game ideas to make this process more interesting.

In Sheeptalk, four words are used and the idea is to herd sheep into a pen by giving Rex, the sheepdog, commands.

After enough practise, speech recognition can be used in personal programs – an interesting challenge for programmers bored with games. Manuals accompany the device and include adequate programming instructions. Micro Command retails at £49.95.

Contact: Orien Data, 31/32 High Street, Dorset Gardens, Brighton. Tel: 0273 672291.

MAGIC VOICE

Magic Voice is a speech synthesiser utilising the text to spech process. it plugs into the cartridge port at the 64's rear and has its own cartridge port permitting other cartridges to be stacked on top. A manual is available.

The voice options are male, female or child. Female voices are rare in speech synthesis, but Commodore plan to use the device in Educational software and consider the children will respond better to a woman's voice.

The module contains enough data to say all 26 letters of the alphabet, as well as a vocabulary of 187 words. It can also repeat numbers and a diskette with extra vocabulary is planned.

Speech and music can be generated simultaneously and by using Commodore BASIC or machine code, voice and graphics can also be used at the same time.

Educational software have been planned and will include Talking Books and B J the Bear, a suite of programs on writing, thinking and arithmetic.

Magic Voice is still not available in this country, although a Commodore spokesman assured CCI that it would be soon. The price is to be decided, but will probably be in the region of £49.95.

Contact: Commodore (UK) Ltd, 1 Hunters Lane, Weldon, Corby, N Hants NN17 1QX. Tel: 0536 205555.

GALA-SPEECH

This is the only speech synthesiser which runs by software alone. It uses the allophone system and is available on cassette for £7.95 and disk for £10.95.

It has an ABC demonstration program with examples of allophones and general rules for their use.

Either machine code or BASIC can be utilised. If the programmer is using BASIC, the command 'say' is incorporated into the program together with the text that is desired.

The speech program is loaded first and followed by the preprogrammed software. The speech program does not interfere with the normal program because it occupies a high place in the memory.

Contact: Gala Soft, 116 Church Parade, Canvey Island, Essex. Tel: 0268 682719.

DUCKWORTH HOME COMPUTING

All books written by Peter Gerrard, former editor of *Commodore Computing International*, author of two top-selling games for the Commodore 64, or by Kevin Bergin. Both are regular contributors to *Personal Computer News, Which Micro?, Popular Computing Weekly* and *Commodore Horizons.*

SPRITES & SOUND ON THE COMMODORE 64
by Peter Gerrard

A complete guide to using the extraordinary features of the Commodore 64, together with a full working explanation of the chips that make it possible: the 6581 Sound Interface Device and the 6566 Video Interface Chip, together with the processor that make it all tick, the 6510.

Sections on programming your own musical instruments, producing sprite and programmable character animation, make this the guide for users of the Commodore 64 who want to get the most from the special features of their computer. *£6.95*

COMMODORE 64 GAMES by Kevin Bergin

This is a collection of 21 exciting programs specially written for the Commodore 64, including Golf, Snake, Air Attack, Draughts, Car Dodge, Tank Battle, and Minefield. An adventure game is also included as well as a program to enable you to devise your own version of Basic by re-defining keywords. Each program is accompanied by notes on its structure to enable you to modify or extend it. *£6.95*

THE COMPLETE 64 ROM DISASSEMBLY
by Peter Gerrard and Kevin Bergin

This book is for anyone who has ever wondered how the Commodore 64 really works. Intended for the serious programmer, it includes fundamental memory maps, memory architecture maps, the disassembly itself and (for reference) the complete machine code instruction set.

£5.95

EXPLORING ADVENTURES ON THE 64
by Peter Gerrard

The complete guide to computer adventure games: playing, writing and solving them. Starting with an introduction to adventures, and their early history, it takes you gently through the basic programming necessary on the 64 before you can start writing your own games. Inputting of information, room mapping, movement, vocabulary, and everything required to write an adventure game are explored in full detail. Then follow a number of adventure scenarios, and finally three complete listings, written specially for the 64. The games are available on one cassette at £7.95.

£6.95

USING THE COMODORE 64
by Peter Gerrard

A complete look at the latest home computer from Commodore Business machines. Starting with a refresher course in Basic Programming, it moves on through machine code, before considering in great detail sprites, graphics and sound. A section on peripherals, and then the heart of the book: an in-depth look at the chips that make it work, including the 6581 Sound Interface Device and the 6566 Video Controller Chip, as well as the heart of the computer, the 6510. The comprehensive appendices cover the full Basic and Machine Code Instruction sets, as well as several useful reference tables, and a complete machine code assembler/disassembler listing.

Personal Computer News said: "In this case, we are dealing with a gem of a book. It deserves a place on the bookshelves of every 64 user whether beginner or expert."

£9.95

Many other books and cassettes are available, write in for a catalogue.

DUCKWORTH, The Old Piano Factory, 43 Gloucester Crescent, London NW1 7DY. Tel: 01-485 3484

Real Music on Computer!

A NEW DIMENSION FOR THE COMMODORE 64

It is now possible, using a MIDI* based music keyboard to use the Commodore 64 with suitable hardware and software to create music of professional quality.

What is MIDI?
Quite simply MIDI (Musical Instrument Digital Interface) is a standard means of communication used by many of the leading instrument keyboard manufacturers, enabling an instrument of one make to 'talk to' another. In practice, using the JMS interface and suitable JMS software a whole new world opens up for the musically minded.

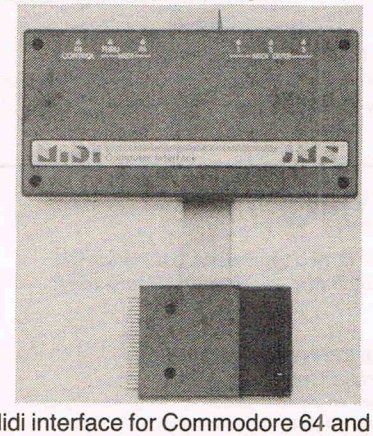
Do I have to be a keyboard player?
Obviously, it helps a great deal if you are! But if not – especially if you can 'Pick out a tune with one finger' you can have enormous fun with the Composer and Studio programs.

What do I need?
A Midi Keyboard with amplifier (there is a wide choice from several manufacturers).
A Midi Interface RMS-2H • RMS Software • A Commodore 64 and 1541 disk drive (or CX 64) • Connecting leads

What can I do with it?
In a word – plenty! Depending on which software you choose you can compose, playback, even use your computer as a 12 Track Recording Studio using facilities unheard of even in sophisticated recording studios.

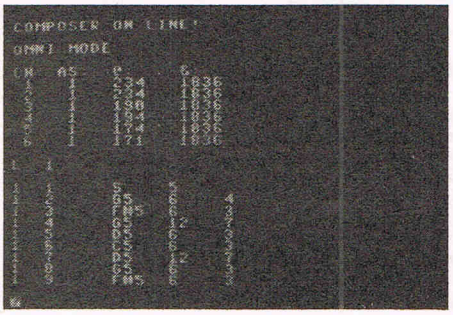
Where can I buy these?
Any good musical instrument shop can supply the software, hardware, and MIDI keyboards. In case of difficulty contact Rosetti.

RMS24 MIDI INTERFACE



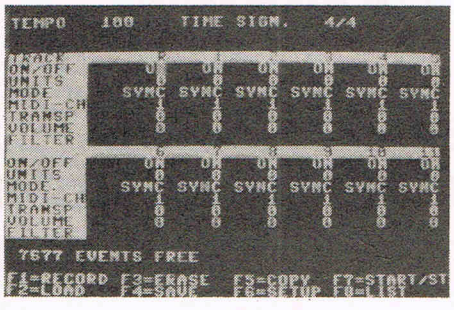
Midi interface for Commodore 64 and Sinclair Spectrum 48k computers. 3 Midi outputs, midi in, midi thru and control in.

RMS20C MULTITRACK COMPOSER



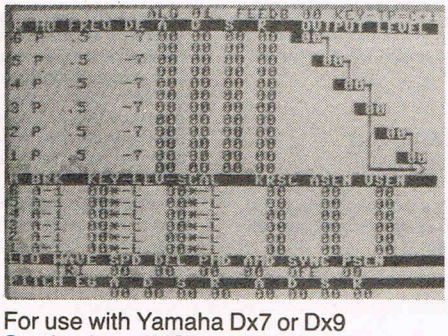
For use with Midi Keyboards, JMS Interface, Commodore 64 or SX64 Computer, Disk Drive, Drum Unit (clock pulse 24). (If using drum unit RMS-5H cable required).
Step time input from computer. Six voice channels. Each voice channel assignable to a Midi channel. Over 1500 steps per channel. Tempo changes without pitch changes. Sound changes can be made in any voice at any point. Supplied with demo/storage disk. Retains Midi key velocity data.

RMS24C RECORDING STUDIO



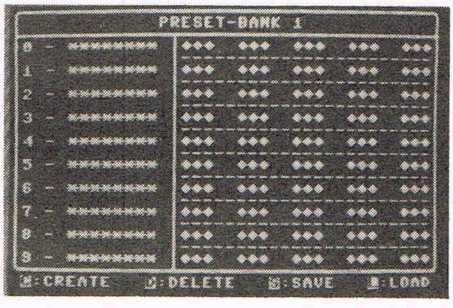
The 12 Track Recording Studio can actually improve on a conventional recording machine.
Tempo change without any change of pitch. A total change of any sound after the recording. Transposition of any sound after recording. Listing and editing of any measure in any channel.

RMS21C SOUND EDITOR



For use with Yamaha Dx7 or Dx9 Synthesiser, JMS Interface, Commodore 64 or SX64 Computer, Disk Drive and Printer (optional).
Displays all sound parameters together on screen. Edit on keyboard and screen parameters change. Print out facility from screen. Store new sounds on floppy disk. Simplifies editing.

RMS25C MASTER KEYBOARD



The Master Keyboard program permits fast control of a series of connected Keyboards. It has the following facilities.
Sounds can be drawn from any connected Midi Keyboard and set into a designated area on the master keyboard. A series of Midi based keyboards and devices can be pre-set to up to 80 variations, enabling the player to reset the entire range of keyboard sounds on stage between numbers. A simulated "drawbar" facility can be used to add harmonies to designated areas of the master keyboard. Pitch variation.

Distributed Worldwide by
Rosetti Limited
138-140 Old Street, London EC1V 9BL
Telephone 01-253 7294

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Telephone 49-231-171921

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Musical Connections

As computers take on a more important role in the music world, Sue Pearce explains the concept of MIDI (Musical Instrument Digital Interface) and talks to well-known musicians about their use of computers.

No article about the growing use of computers in music would be complete without a mention of MIDI (Musical Instrument Digital Interface). MIDI is an interface specification enabling easy and inexpensive interconnection of digital equipment such as synthesisers, sequencers and computers.

Before MIDI, older analogue synthesisers used a system of 1 volt per octave. What they had on the back was a CV (control voltage) gate. The gate being either on or off. You needed four strands of wire for each note. Two notes required eight strands of wire, and so on. You can imagine the spaghetti effect of all that wire.

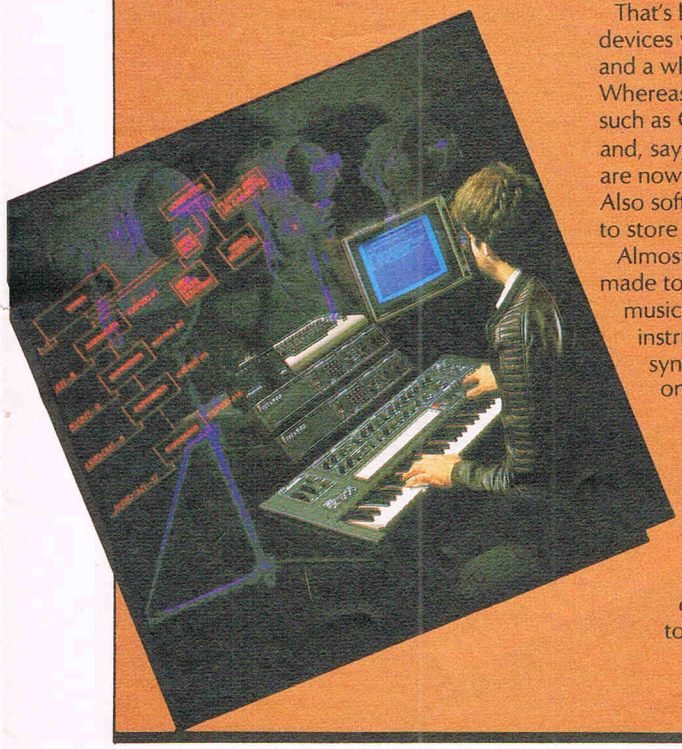
These synthesisers were only compatible on 1v systems. Another problem was voltage control. DCO's (digital control octaves) were stable, but didn't control voltage.

There came a stage in the development of synthesisers where manufacturers were using micro processors more and more in production. Musical instruments are of a nature where you may want to use them together with other instruments. Like a computer, the synthesiser has peripherals – synthesisers have sequencers.

Some manufacturers instruments worked with others, some did not. Before things went too far, the manufacturers decided to get together and devise a standard. After all, all were using similar technology for keyboards, so why not make them all the same?

After much discussion, MIDI (Musical Instrument Digital Interface) was born. All the information passes along one wire. Each piece of information takes a very short amount of time to travel – just 320 microseconds. So short that it is not registered by the human ear. The line is then clear for another message.

The hardware used is a 5-pin Din (although only two pins are actually used). It's a very common and cheap device unlike something such as a centronics plug.



That's how it all began. Now there are devices which interface with computers and a whole new industry is emerging. Whereas in the past you had companies such as Commodore making computers and, say, Roland making keyboards, there are now third parties making interfaces. Also software houses are writing programs to store sound on the computer.

Almost all musical instruments are now made to meet MIDI specifications. Many musicians and groups link their instruments, so, for example, two synthesisers can be played from just one keyboard. Or a drummer can now even be replaced by a drum machine. Now, in addition to the numerous sound packages available to create music on the 64 (see this month's product survey), there is vast scope for the home computer owner to link musical instruments to computers such as the 64.

Manufacturers have not been slow to recognise this potential market. Siel, for example, feels that its future lies within the compatibility of electronic keyboards and computers. Their aim is to bring music to computer owners and computers to synthesiser owners.

A series of keyboards is being introduced by Siel aimed at the home, education and computer markets. And Siel's MIDI Computer Interface allows connection to computers using CPUs Z80, 6502 and 6510. Any MIDI equipped instrument may be interfaced directly to a computer for musical control.

This range is being backed up with a range of computer software. For example, a Composer/Arranger program for the 64 which is a six track pulse time sequencer. Each track is inputted monophonically via the Qwerty keyboard in terms of step number, note name and octave, note duration and gate time. The program's flexibility allows full stacatto and legato in Omni and Poly MIDI modes.

While Siel are making a definite attempt to cater for this new market, the availability of MIDI interfaces means that instruments from most manufacturers such as Roland and Yamaha can be linked to your computer. Admittedly it can be an expensive affair, but computer enthusiasts with a bent for music will be more than pleased with the result. (If your budget is limited you should enter this month's music competition, the prize being Casio's MT200 keyboard plus the PA-1 interface – all you need to set you on your way!)

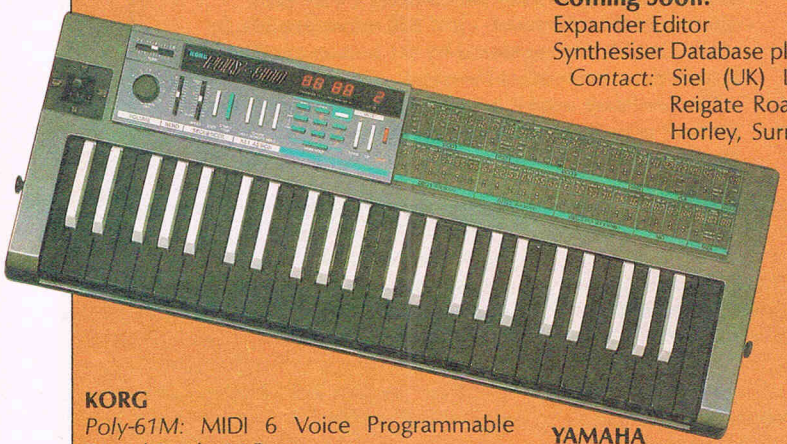
There are music shops and centres all over the country whose staff are trained to advise customers on a suitable purchase for their price range and requirements. Some of these are listed in this feature along with a list of some of the many manufacturers and instruments that can be interfaced with a computer.

If you are interested in interfacing instruments with your computer and would like to research a little deeper into the concept, there is a MIDI Users Group at 8426 Vine Valley D.R. Sun Valley, CA91352, USA.

SIEL
MK 900

SIEL
DK 600: MIDI 6 Voice Programmable Polyphonic Synthesiser
Price: £999
MK 900: MIDI Keyboard
Price: £449
MIDI Computer Interface
Price: £99
Siel Software for the 64:
Composer/arranger program – disk £39, cassette £36
16 track Live Sequencer – disk £69.50, cassette £64

Coming Soon:
Expander Editor
Synthesiser Database plus programs
Contact: Siel (UK) Ltd, AHED Depot, Reigate Road, Hookwood, Horley, Surrey. Tel: 02934 76153.



KORG
Poly-800

KORG
Poly-61M: MIDI 6 Voice Programmable Digital Synth, 64 Program.
Price: £849
Poly-800: MIDI Programmable 8 Voice Digital Synth
Price: £575
EX-800: MIDI Programmable 8 Voice Synth Module
Price: £425
RK-100: Remote MIDI Keyboard
Price: £499
DDM-110: Programmable Digital Drum Machine
Price: £229
DDM-220: Programmable Digital Percussion
Price: £229
Contact: Rose Morris Ltd, 32-34 Gordon House Road, London NW5. Tel: 01-267 5151.

YAMAHA
DX-7: Digital Algorythm Synthesiser
Price: £1399
Contact: Yamaha, Mount Avenue, Bletchley, Milton Keynes, Bucks. Tel: 0908 71771.

CASIO
MT200

CASIO
CT6000: MIDI Synthesiser
Price: £600
Contact: Casio, Unit 6, 1000 North Circular Road, London NW2 7JD. Tel: 01-450 9131.

JMS
RMS-20c: MIDI Multitrack Composer
Price: £49.95
RMS-23c; MIDI Arpeggiator Program
Price: £19.95
RMS-25c: MIDI Master Keyboard
Price: £99.95
MIDI Recording Studio
Price: £99.95
Contact: Rosetti Ltd, 138-140 Old Street, London EC1. Tel: 01-253 7294.

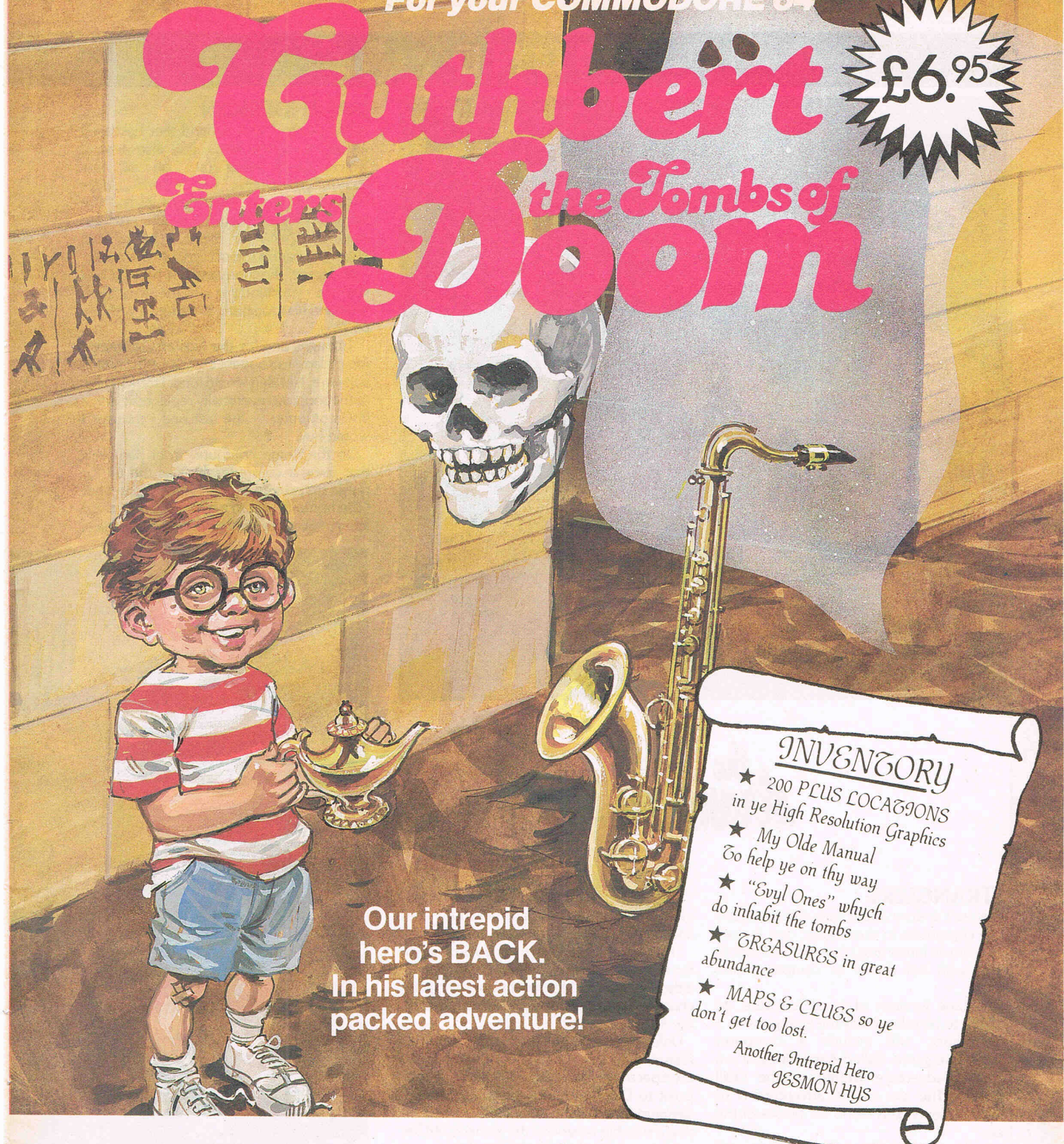
MPC ELECTRONICS
Music Percussion Computer
Price: £595
Contact: MPC Electronics, The Gables, Willingham, Cambridge. Tel: 0954 60264.

ROLAND
Juno 106 – Analogue synthesiser
Price: £800
Contact: Roland, Unit 6, Great West Trading Estate, 983 Great West Road, Brentford, Middx. Tel: 01-568 4578.

SEQUENTIAL CIRCUITS
Model 64: MIDI Sequencer
Price: £185
Six-Trak: Multi-trimbral Polyphonic Synthesiser
Price: £800
Contact: Available through leading music shops.

MICRO MUSICAL
(Software for use with Casio MT-200 and PA-1 Interface)
Microlink System ML-11: Editor/interface
Price: £29.95
Microlink System ML-13: Interface
Price: £19.95

AUTOGRAPHICS
Microsound 64: Full-size, 4 octave Keyboard
Price: £145 (plus £3 p&p)
Contact: Autographics Ltd, 3a Reading Road, Henley-on-Thames, Oxon. Tel: 0491 575 469.


For your COMMODORE 64
Cuthbert Enters the Tombs of Doom
£6.95
INVENTORY
★ 200 PLUS LOCATIONS in ye High Resolution Graphics
★ My Olde Manual To help ye on thy way
★ "Evyl Ones" whych do inhabit the tombs
★ TREASURES in great abundance
★ MAPS & CLUES so ye don't get too lost.
Another Intrepid Hero
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the stranglers

STRANGLERS

This isn't a story about how the Stranglers use computers in their music, but it does concern an interesting concept which ties in well with our theme of computers and music.

All tape versions of Aural Sculpture, an album to be released by the Stranglers on 5 November, will include a computer adventure game. Called Aural Quest, it is a lengthy adventure written on the Quill system. The aim of the adventure is to search around the world for pieces of the ear.

Keyboard player Dave Greenfield, himself a keen adventure player, says: "Nobody has put an adventure game onto a musical release before. Initially the idea was formed within the band and it was designed by Mike Turner of Star Dreams."

Throughout the game clues are provided in the form of burst of Strangler's music and lines from the band's songs.

"The player doesn't have to be a Stranglers fan to complete the adventure," says Dave, although presumably most people who purchase the album will already be familiar with the Stranglers music.

Unfortunately, the version of Aural Quest featuring on the album is only suitable for the Spectrum. However while berating this point to Dave, he did suggest that should demand for a 64 version exist it is possible that a suitable version of the game could be made available through the fan club.

So if you are interested it's up to you to generate that demand. The address to write to is Stranglers Information Service, PO Box 32, Shepperton Studio Centre, Studios Road, Shepperton Road, Middlesex.

IAN ANDERSON

While Jethro Tull is a band that has been around for many years, it is also a band which keeps close tabs on all new technology. During the recent 'Under Wraps' tour I went along to the Hammersmith Odeon to talk to Ian Anderson (who for many IS Jethro Tull) about the band's use of computers in music.

Backstage, the interview got off to a bad start with Ian launching into the story of his brief and disappointing experience with the 64.

"I bought one for the kids at Christmas," recalls Ian. "I also spent £100 on educational software. Nothing would load. I took it back to the shop and eventually replaced it with a BBC computer – the last one I thought I would buy."

On the home computer front, Ian feels that using a computer such as the 64 for music purposes is purely hobbyist. He says: "The home-user with a computer might find it fun to play around with music, but it strikes

me as being hobby orientated and low in terms of output.

"There are a number of music programs that hve been utilised with the 64," continues Ian. "But my own opinion is that if you are talking about music in any serious application, with any control, you are down to spending money.

"I don't really believe in the future of any home computer systems for the home user who also happens to be a musician, other than rudimentary assistance.

"It needs a dedicated system. It isn't like playing Pac-Man – you can't play games with a 24 multi-track, but it's a useful tool for professionality.

Returning to Jethro Tull's use of computers, Ian explains that each of the keyboards on stage feature a number of micro processors.

"Looking at the level of dedicated computer technology in something like the Roland Sequencer – they are all simple computers in that its limitations are in terms of the way it is programmed.

"When you get into the serious stuff such as the Fairlight or Sinclavier, which use Winchester disk drives, you are talking about computers that have far more capability – really industrial machines."

They also cost more at between £20-30,000!

At this point in the interview, Peter-John Vettese took over to elaborate on the band's use of computers on stage.

PETER-JOHN VETTESE

As the keyboard player, Peter-John Vettese was nominated as the most logical person to explain how Jethro Tull are using computer technology as a stage medium.

Peter immediately reeled off a long list of instruments which are MIDI'd together including Yamaha and Oberheim keyboards, expanders, emulators, sequencers and vocoders!

"The computer revolution has taken place," comments Peter. "Things changed when digital sound came about. For example, when the Yamaha DX7 was launched it was entirely digital and used frequency modulation as the sound source.

"The advantage is programmability" he continues. "You can store a program and switch instantly from program to program. Then there's MIDI which enables you to multi-layer, which you can't do with gates and CV's."

Peter explains that the Fairlight and Sinclavier synthesisers use a computer terminal and disk drive and therefore are, in effect, computer music studios.

Jethro Tull also make use of drum machines. When the last album, Walk Into Light, was recorded the group had not yet discovered the drumming talents of Don Perry. Peter recalls: "Ian and I used the Linn drum on the last album. On stage it is replaced by the fantastic playing of Don Perry!

"The advantage of a drum machine is that the writer of a song is allowed to program what he thinks the drums should be doing. On the other hand, the disadvantage is that the creative element of another brain is missing."

Does the use of computers in music take away some of the natural creativity of musicians? Peter believes that the most natural instrument for a human to use is his or her voice and that some synthesisers are lacking in human expression. However, he says: "The ones I play have as much if not more expression than any other conventional instrument. They can only be that way because of computers. Velocity, volume – the whole thing is monitored by computers.

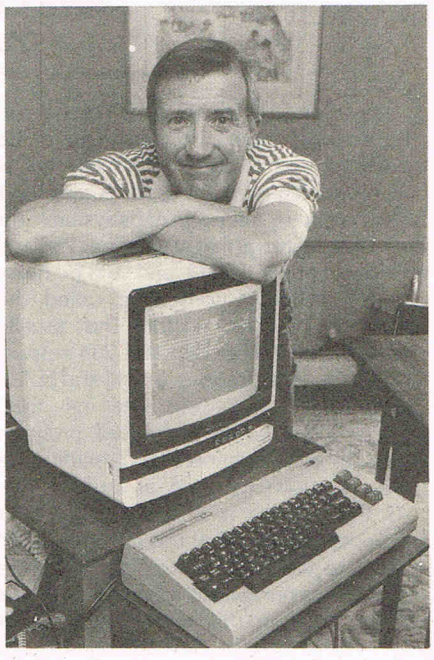
"I can be as emotional and expressive in my music as anybody can. And that is only because there are computers."

ROY CASTLE

Whenever I think of Roy Castle, I think back to his TV series 'Record Breakers' and in particular to one program in which Roy attempted to play a record breaking number of instruments – and make music from objects that are far from being instruments in the true sense. It isn't everyone who can play a tune on a teapot!

So when we heard that Roy was now the proud owner of a 64 we couldn't wait to find out just what he was doing with it. Transforming it into a wind instrument? Or maybe using it for percussion?

Nothing that dramatic as it turned out, but Roy does find the 64 invaluable in writing music.



"It certainly doesn't replace real instruments," comments Roy. "What it does do is to allow you to very deliberately plan a musical arrangement and listen to it.

"It's a very good way of learning how to listen to an orchestration without trying to write it not knowing how it will sound. After all not many people can afford to employ a whole orchestra to listen to how it is coming on."

Roy originally bought the 64 to enable his children to have access to "what is obviously the thing of the future". He says: "I'm not very good at it yet. In programming terms I'm still a baby, but I do realise its potential. It's quite difficult," he continues. "It's like learning a new language, but once you've mastered the technique...

"I would never want to eliminate real instruments because of the personal attitude and live music," continues Roy. "But it's obviously the thing of the future. Soon the whole world will be computerised."

Musical interrupts

One of the common features shared by a number of popular arcade games at the moment (Frantic Freddie is a prime example) is that of musical interrupts. In other words, while the program is getting one with doing one thing, a tune miraculously carries on in the background. Pete Gerrard explains, with the aid of a mixture of Basic and machine code, how it's done.

Since this whole thing is based on interrupts, there's obviously got to be something somewhere in the 64 that is capable of being interrupted. A glance at one of the many memory maps available for the machine shows that at locations 788 and 789 decimal (or $0314 and $0315 hexadecimal), there is something called the hardware interrupt vector. This usually contains the numbers 49 and 234 respectively in the two locations, or $31 and $EA in hexadecimal. This tells the 64 that, everytime this routine is checked, program flow must go to location $EA31, reading the numbers in low-high order as usual.

As this routine is checked with great frequency, we can alter this (it is only RAM after all) to jump to a routine of our own. The main thing to remember is, having made this change, to ensure that at some point in our own routine program flow still branches to that routine at $EA31, which updates the clock, amongst other things, and generally helps keep the 64 ticking over. If this call wasn't present, it would be a very sick 64 indeed, and your musical career would die at birth.

Re-routing interrupts

So the first thing to do is alter the content of those two locations, which is really the only purpose of the first and third blocks of machine code. Set interrupt disable (in other words, we don't want to be disturbed), load the accumulator with $50 and store it at location $0314, load the accumulator with $C0 and store that at location $0315, clear interrupt disable (in other words, carry on interrupting), do nothing for a bit and return from this subroutine.

The last part of the routine sets everything back to normal.

What have we achieved by doing this? Well, program flow from the hardware interrupt vector no longer goes off to location $EA31 directly, it now goes there via location $C050 instead. This is set up by typing in SYS49152, and everything is returned to normal by typing SYS49171. However, since we haven't got any code at location $C050, there's not a lot of point in typing this just yet.

Getting Going

Without an assembler, typing all this in is going to be tricky from the machine code listings, and so the data program has been included as well. This is in fact longer than the machine code equivalent, since the listings only show the relevant parts of the machine code, not the gaps in between. But, if you haven't got an assembler you'll just have to resign yourself to doing a bit more typing.

The last two blocks of machine code (the hexadecimal dumps) are the actual tune that is going to be played: in this case, a simple boogie riff, since my musical talent is minimal. Again, these can be typed in either with an assembler, or you'll hve to do it the long way and enter all the data.

The final bit of typing is the Basic program headed Musical Interrupts. Straightforward, since it's all in Basic. The only line needing an explanation at the moment, in order that you can get it working before we dive into the great explanation of how it all does what it does, is line 5. This checks a memory location where part of the machine code lies, and if that location doesn't contain a 65, then we load the program 'boogietime' from disk. If you're using a tape system, change that eight to a one. 'Boogietime' is just the name I gave to the whole of the machine code collection of routines.

If you have got it all typed in, just run the Basic program as a normal Basic program, and sit back and listen to the music. Now, the great question, how does it all work?

Basic program explanation

Taking this line by line, we have:

Line 3: Set the border and background colours, revert to an upper case/lower case display, and print up a title.

Line 5: See if the machine code is in place, and if it isn't load it in.

Line 10: See the variable S to equal the start of the SID chip, and set the low order pulse frequency for voice 3 to be maximum, give it an attack/decay setting of 142 and a sustain/release setting of 150.

Line 20: Turn the volume up to maximum, and POKE some values which the machine code program will later use.

Line 30: More values for the machine code program.

Line 100-120: Do the same for voice 2 before activating the routine with a call of SYS49152.

Lines 130- : Just a little demo to prove that you can carry on doing things while the tune is playing.

Machine Code explanation

We'll just concentrate on the routine for voice 3 (which lies from locations $C050 to $C0AF), as the one for voice 2 is virtually identical.

First of all, check the content of location $C042 (49218), and if it contains a zero then carry on with the program. If not, jump to the internal routine at $EA31 and carry on as normal.

Decrease the content of location $C041 (49217) and if that isn't equal to zero, branch back to $C058 and off to $EA31 again.

Load the accumulator with the content of location $C040 and store it at $C041. These are all the locations that our earlier Basic program poked when it was setting everything up.

Now the next lot of instructions, concerning locations $FB, $FC and so on, requires a

bit of discussion. The locations used (and the ones in block four of the machine code as well) form part of what is referred to as page zero of the 64's memory map, and it so happens that these locations don't do very much, we can use them ourselves to store numbers in. The Basic program earlier poked some values into these locations, 178 and 192 for locations $FB and $FC respectively, which form, when linked together, the hexadecimal number $C0B2 (since 178 is $B2 in hexadecimal, 192 is $C0, and we reverse the order of the numbers as usual).

What the rest of this machine code program is doing, is to load the accumulator with the value to be found in locations $C020 onwards, and store that value in the locations that form the high and low order frequencies for the note to be played by voice 3.

Complicated eh? This 'offset' machine code instruction is not one of the easiest in the world to understand, and many competent machine code programmers will probably never use it, which is a shame, since it makes this type of program so much easier to write. Without using it, the code needed here would be about five times as long as is necessary.

The latter part of the program turns the waveform off and on again (as should always be done before playing a note, otherwise you'll usually just get silence), jumps off to the other routine to play the next note for voice 2, before finally setting everything back to normal and going back to start all over again.

The end of a tune is indicated by a value $FF, or decimal 255, being read, so just make sure that none of your musical notes contain this value.

By altering what is stored in locations $C0B2 and $C8B2 onwards, you can change the tune that is being played, and since this code is well spaced out there is room to have something like 900 notes in each tune before running out of space, which should be enough to keep most people happy.

Conclusion

You'll probably only really understand what's going on by typing everything in, getting it running, and then experimenting with it to see what happens. Do make sure that you save copies of everything to tape or disk before attempting to run it, because a simple error in entering the code can so easily cause the machine to crash.

By changing the ADSR settings for the voices, perhaps experimenting with different wave forms, different pulse widths, and so on, you should be able to produce some excellent background music for your programs. Voice one is still available to perform as normal, so you can still have various sound effects being played as well as the tune.

Have fun!

```
BASIC INTERRUPT PART ONE

10 FORI=0TO71:READA:B=B+A:POKE49152+I,A:NEXT
12 IFB<>11101THENPRINT"ERROR IN BLOCK #0":STOP
20 FORI=72TO143:READA:C=C+A:POKE49152+I,A:NEXT
22 IFC<>11286THENPRINT"ERROR IN BLOCK #1":STOP
30 FORI=144TO175:READA:D=D+A:POKE49152+I,A:NEXT
32 IFD<>4866THENPRINT"ERROR IN BLOCK #2":STOP
34 PRINT"PART ONE OF DATA ENTERED CORRECTLY AND  N
OW IN PLACE.":END
30000 REM BLOCK # 0
30001 DATA234,234,234,120,169,80,141,20
30002 DATA3,169,192,141,21,3,88,234
30003 DATA234,96,120,169,49,141,20,3
30004 DATA169,234,141,21,3,88,234,96
30005 DATA234,222,222,222,222,222,222,222
30006 DATA222,222,222,222,222,222,222,222
30007 DATA222,222,222,222,222,222,222,222
30008 DATA222,222,222,222,222,222,222,222
30009 DATA10,9,0,65,0,0,0,0
30010 REM BLOCK # 1
30011 DATA0,0,0,65,0,0,0,0
30012 DATA234,234,234,173,66,192,240,4
30013 DATA76,49,234,234,206,65,192,208
30014 DATA247,234,234,234,173,64,192,141
30015 DATA65,192,234,230,251,208,2,230
30016 DATA252,234,160,0,177,251,201,255
30017 DATA240,40,234,234,234,234,160,0
30018 DATA141,15,212,230,251,208,2,230
30019 DATA252,234,177,251,141,14,212,173
30020 REM BLOCK # 2
30021 DATA67,192,72,169,0,141,18,212
30022 DATA104,141,18,212,234,234,76,100
30023 DATA200,234,234,234,165,253,133,251
30024 DATA165,254,133,252,76,100,192,0
```

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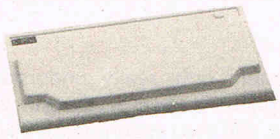

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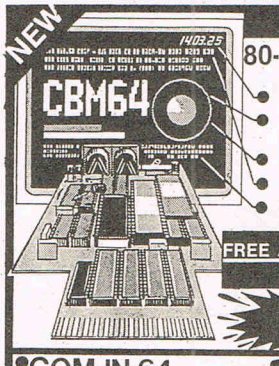

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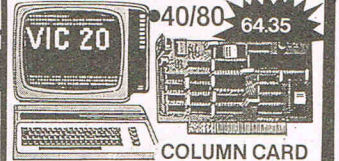

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015

BASIC INTERRUPT PART TWO

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10 FORI=0TO71:READA:B=B+A:POKE51200+I,A:NEXT
12 IFB<>11110THENPRINT"ERROR IN BLOCK #0":STOP
20 FORI=72TO143:READA:C=C+A:POKE51200+I,A:NEXT
22 IFC<>11280THENPRINT"ERROR IN BLOCK #1":STOP
30 FORI=144TO175:READA:D=D+A:POKE51200+I,A:NEXT
32 IFD<>4835THENPRINT"ERROR IN BLOCK #2":STOP
40 PRINT"PART TWO OF DATA ENTERED CORRECTLY AND  N
OW IN PLACE.":END
30000 REM BLOCK # 0
30001 DATA234,234,234,120,169,80,141,20
30002 DATA3,169,200,141,21,3,88,234
30003 DATA234,96,120,169,49,141,20,3
30004 DATA169,234,141,21,3,88,234,96
30005 DATA234,222,222,222,222,222,222,222
30006 DATA222,222,222,222,222,222,222,222
30007 DATA222,222,222,222,222,222,222,222
30008 DATA222,222,222,222,222,222,222,222
30009 DATA10,10,0,65,0,0,0,0
30010 REM BLOCK # 1
30011 DATA0,0,0,65,0,0,0,0
30012 DATA234,234,234,173,66,200,240,4
30013 DATA76,49,234,234,206,65,200,208
30014 DATA247,234,234,234,173,64,200,141
30015 DATA65,200,234,230,247,208,2,230
30016 DATA248,234,160,0,177,247,201,255
30017 DATA240,40,234,234,234,234,160,0
30018 DATA141,8,212,230,247,208,2,230
30019 DATA248,234,177,247,141,7,212,173
30020 REM BLOCK # 2
30021 DATA67,200,72,169,0,141,11,212
30022 DATA104,141,11,212,234,234,76,49
30023 DATA234,234,234,234,165,249,133,247
30024 DATA165,250,133,248,76,100,200,0
```

READY.

TUNE IN BASIC

```
10 FORI=0TO80:READA:B=B+A:POKE49331+I,A:NEXT
12 IFB<>2543THENPRINT"DATA ERROR IN BLOCK #0":STOP
20 B=0:FORI=0TO80:READA:B=B+A:POKE51379+I,A:NEXT
22 IFB<>4541THENPRINT"DATA ERROR IN BLOCK #2":STOP
24 PRINT"DATA ENTERED CORRECTLY AND CODE NOW IN  P
LACE."
30000 REM BLOCK # 0
30001 DATA4,73,0,0,4,73,0,0
30002 DATA4,73,0,0,4,73,0,0
30003 DATA4,73,0,0,4,73,0,0
30004 DATA4,73,0,0,4,73,0,0
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```
30005 DATA5,185,0,0,5,185,0,0
30006 DATA5,185,0,0,5,185,0,0
30007 DATA4,73,0,0,4,73,0,0
30008 DATA4,73,0,0,4,73,0,0
30009 DATA6,106,0,0,6,106,0,0
30010 REM BLOCK # 1
30011 DATA5,185,0,0,5,185,0,0,255
30021 DATA4,73,5,103,6,106,7,53
30022 DATA7,163,7,53,6,106,5,103
30023 DATA4,73,5,103,6,106,7,53
30024 DATA7,163,7,53,6,106,5,103
30025 DATA5,185,7,69,8,147,9,159
30026 DATA10,60,9,159,8,147,7,69
30027 DATA4,73,5,103,6,106,7,53
30028 DATA7,163,7,53,6,106,5,103
30029 DATA6,106,8,23,9,159,8,23
30031 DATA5,185,7,53,8,147,7,53,255

READY.
```

MUSICAL INTERRUPTS

```
3 POKE53280,9:POKE53281,7:POKE53272,23:PRINTCHR$(1
47)"[BLK]WELCOME TO THE SHOW."
5 IFPEEK(49219)<>65THENLOAD "BOOGIETIME",8,1
10 S=54272:POKES+17,255:POKES+19,142:POKES+20,150
20 POKES+24,15:POKE49216,10:POKE49218,0:POKE49219,
65:POKE251,178:POKE252,192
30 POKE253,178:POKE254,192
100 POKES+10,255:POKES+12,142:POKES+13,150
110 POKE51264,10:POKE51266,0:POKE51267,65:POKE247,
178:POKE248,200
120 POKE249,178:POKE250,200:SYS49152
130 PRINT:PRINT:PRINT"AS YOU CAN NOW HEAR. IF YOU
VE GOT THE  VOLUME TURNED UP. ":
140 PRINT"THERE IS SOME MUSIC   PLAYING IN THE BAC
KGROUND. WHILE WE CAN ":
150 PRINT"STILL CARRY ON WITH SOME PROGRAMMING."
160 PRINT:PRINT"TO PROVE IT, LET'S PRINT OUT THE N
UMBERS1 TO 100.":PRINT
170 FORI=1TO2000:NEXTI
180 FORI=1TO100:PRINTI::NEXT
190 PRINT:PRINT:PRINT"YOU CAN BREAK INTO THE PROGR
AM AND LIST IT IF YOU LIKE."
200 GOTO200

READY.
```

```
B*
   PC  SR AC XR YR SP
.:87D8 33 00 C0 00 F6
.
C000 EA          NOP
C001 EA          NOP
C002 EA          NOP
C003 78          SEI
C004 A9 50       LDA #$50
C006 8D 14 03    STA $0314
C009 A9 C0       LDA #$C0
C00B 8D 15 03    STA $0315
C00E 58          CLI
C00F EA          NOP
C010 EA          NOP
C011 60          RTS
C012 78          SEI
C013 A9 31       LDA #$31
C015 8D 14 03    STA $0314
C018 A9 EA       LDA #$EA
C01A 8D 15 03    STA $0315
C01D 58          CLI
C01E EA          NOP
C01F 60          RTS
C020 EA          NOP
.
.
C050 EA          NOP
C051 EA          NOP
C052 EA          NOP
C053 AD 42 C0    LDA $C042
C056 F0 04       BEQ $C05C
C058 4C 31 EA    JMP $EA31
C05B EA          NOP
C05C CE 41 C0    DEC $C041
C05F D0 F7       BNE $C058
C061 EA          NOP
C062 EA          NOP
C063 EA          NOP
C064 AD 40 C0    LDA $C040
C067 8D 41 C0    STA $C041
C06A EA          NOP
C06B E6 FB       INC $FB
C06D D0 02       BNE $C071
C06F E6 FC       INC $FC
C071 EA          NOP
C072 A0 00       LDY #$00
C074 B1 FB       LDA ($FB),Y
C076 C9 FF       CMP #$FF
C078 F0 28       BEQ $C0A2
C07A EA          NOP
C07B EA          NOP
C07C EA          NOP
C07D EA          NOP
C07E A0 00       LDY #$00
C080 8D 0F D4    STA $D40F
C083 E6 FB       INC $FB
C085 D0 02       BNE $C089
C087 E6 FC       INC $FC
C089 EA          NOP
C08A B1 FB       LDA ($FB),Y
C08C 8D 0E D4    STA $D40E
C08F AD 43 C0    LDA $C043
C092 48          PHA
C093 A9 00       LDA #$00
C095 8D 12 D4    STA $D412
C098 68          PLA
C099 8D 12 D4    STA $D412
C09C EA          NOP
C09D EA          NOP
C09E 4C 64 C8    JMP $C864
C0A1 EA          NOP
C0A2 EA          NOP
C0A3 EA          NOP
C0A4 A5 FD       LDA $FD
C0A6 85 FB       STA $FB
C0A8 A5 FE       LDA $FE
C0AA 85 FC       STA $FC
C0AC 4C 64 C0    JMP $C064
C0AF 00          BRK
.
.
C800 EA          NOP
C801 EA          NOP
C802 EA          NOP
C803 78          SEI
C804 A9 50       LDA #$50
C806 8D 14 03    STA $0314
C809 A9 C8       LDA #$C8
C80B 8D 15 03    STA $0315
C80E 58          CLI
C80F EA          NOP
C810 EA          NOP
C811 60          RTS
C812 78          SEI
C813 A9 31       LDA #$31
C815 8D 14 03    STA $0314
C818 A9 EA       LDA #$EA
C81A 8D 15 03    STA $0315
C81D 58          CLI
C81E EA          NOP
C81F 60          RTS
C820 EA          NOP
.
.
C850 EA          NOP
C851 EA          NOP
C852 EA          NOP
C853 AD 42 C8    LDA $C842
C856 F0 04       BEQ $C85C
C858 4C 31 EA    JMP $EA31
C85B EA          NOP
C85C CE 41 C8    DEC $C841
C85F D0 F7       BNE $C858
C861 EA          NOP
C862 EA          NOP
C863 EA          NOP
C864 AD 40 C8    LDA $C840
C867 8D 41 C8    STA $C841
C86A EA          NOP
C86B E6 F7       INC $F7
C86D D0 02       BNE $C871
C86F E6 F8       INC $F8
C871 EA          NOP
C872 A0 00       LDY #$00
C874 B1 F7       LDA ($F7),Y
C876 C9 FF       CMP #$FF
C878 F0 28       BEQ $C8A2
C87A EA          NOP
C87B EA          NOP
C87C EA          NOP
C87D EA          NOP
C87E A0 00       LDY #$00
C880 8D 08 D4    STA $D408
C883 E6 F7       INC $F7
C885 D0 02       BNE $C889
C887 E6 F8       INC $F8
C889 EA          NOP
C88A B1 F7       LDA ($F7),Y
C88C 8D 07 D4    STA $D407
C88F AD 43 C8    LDA $C843
C892 48          PHA
C893 A9 00       LDA #$00
C895 8D 0B D4    STA $D40B
C898 68          PLA
C899 8D 0B D4    STA $D40B
C89C EA          NOP
C89D EA          NOP
C89E 4C 31 EA    JMP $EA31
C8A1 EA          NOP
C8A2 EA          NOP
C8A3 EA          NOP
C8A4 A5 F9       LDA $F9
C8A6 85 F7       STA $F7
C8A8 A5 FA       LDA $FA
C8AA 85 F8       STA $F8
C8AC 4C 64 C8    JMP $C864
C8AF 00          BRK
.
.
.:C0B3 04 49 00 00 04 49 00 00
.:C0BB 04 49 00 00 04 49 00 00
.:C0C3 04 49 00 00 04 49 00 00
.:C0CB 04 49 00 00 04 49 00 00
.:C0D3 05 B9 00 00 05 B9 00 00
.:C0DB 05 B9 00 00 05 B9 00 00
.:C0E3 04 49 00 00 04 49 00 00
.:C0EB 04 49 00 00 04 49 00 00
.:C0F3 06 6A 00 00 06 6A 00 00
.:C0FB 05 B9 00 00 05 B9 00 00
.
.
.:C8B3 04 49 05 67 06 6A 07 35
.:C8BB 07 A3 07 35 06 6A 05 67
.:C8C3 04 49 05 67 06 6A 07 35
.:C8CB 07 A3 07 35 06 6A 05 67
.:C8D3 05 B9 07 45 08 93 09 9F
.:C8DB 0A 3C 09 9F 08 93 07 45
.:C8E3 04 49 05 67 06 6A 07 35
.:C8EB 07 A3 07 35 06 6A 05 67
.:C8F3 06 6A 08 17 09 9F 08 17
.:C8FB 05 B9 07 35 08 93 07 35
```

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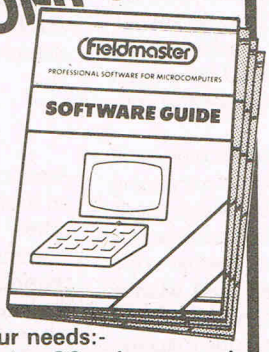

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LETTERS

Dear Editor
I have purchased Volume 2, numbers 9 to 12 of your magazine in computer stores here in Toronto.

The first program I have typed in is "Reformed characters" from page 64 of Volume 2 No 9, but I can't make it work. I typed in the monitor dump and it works, but ONLY FOR THE FIRST LINE of any program. Lines after the first are not reformed.

I have checked my typing very carefully twice and I'm convinced I have got it right. What could be wrong?

A W Ludlam
Islington Ontario
Canada

The best advice we can give you is to recheck the whole program again as we have found no mistakes. There are qite a few numbers to type in and an error is easily made. Sorry we can't be more exact!

Dear Editor
How do you record sounds from the 64?

I would like to record the sound of Morse on to a Ferguson Cassette Recorder. It has a 5-pin Din Socket. Is there any way of connecting the 64 to the Ferguson.

Thanks for the great magazine!

Mr J J Sales
Lancaster
LA15 5RW

It is possible to connect the Ferguson to the 64, but you will need to make your own cable connections.

Pins 2 and 3 are the important ones and are respectively the ground and the audio out. You can either splice the cable yourself or get someone else to do it so that the cable plugs into the 5 pin Din audio/video socket at the back of the 64. Fit a suitable 5 pin din plug on the cable for the Ferguson.

If you are still unsure contact Ferguson themselves, they may have some useful tips.

Dear Editor
I noticed that in the June Letter's Page, Mr Geest from Belgium wanted to know if there were any user clubs in that country.

We started a 64 user club in Leuven a few months ago. Ring or write to either myself (address below) or Charles Rondas of Gelijkheidsstraat 2, 3200 Leuven, Tel: 25.73.77.

Willy Wellekens
Molenstraat 147
B-3200 Leuven
Tel: 25.52.50

Dear Editor
I bought your magazine for the first time last month in my capacity as a new 64 owner, primarily because of the machine code merge and renumber routines. I have been unable to merge disk files together and your program looked ideal.

However, I didn't really want to type in all the machine code and decided to try using the "VIC 1541 single drive floppy disk user's manual". On page 16, a COPY command is explained, together with the "format copy to combine files" and having tried what it suggests (plus various alterations) I fear I shall be obliged to type in your machine code!

Could you tell me if it is possible to make Print 15,"CO:newfile=*:oldfile1,0:oldfile2,0:oldfile3,0:oldfile4" do more than copy just one file, as that is all I achieve at present.

Nigen Tantrum
Reading
Berks

First the bad news – the COPY command in the manual mentioned is really intended for a 4040 dual disk drive and it can't be used to merge files. What it does do is transfer files from one disk to another in the 4040 disk drive.

The good news is that our Merge routine will be ideal for your requirements and will be worth the effort of typing the program in!

Dear Editor
Are there any interfaces on the market for the 64 which satisfy the following criteria.

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* Does not need any modifications on the 64 firmware, but automatically and transparently converts – in hardware – the standard printer codes of the 64 to the Centronic standards.

If no device exists, please could you tell me which unit would satisfy some of these requirements.

Michael Buckner
Balham
London SW12 8SQ

The perfect interface awaits you! The Tripler or Vic Sprinter from Ram Electronics – 106 Fleet Road, Fleet, Hants. Tel: 02514 5858 – satisfies all those requirements and costs £49.95.

Dear Editor
Could you please tell me if American games which are bought on cassette in America will run on British 64 systems?

Ewan Watson
Perthshire
Scotland

American manufacturers usually put a check on their software, but if they don't, the software will be compatible with British systems. It's worth asking before purchasing. If there is a check, then you are likely to have quite a few problems!

It really depends on the complexity of the game. The more complicated ones will probably crash. The quality of games which contain a lot of graphics and colour will probably be rather dubious when played on British 64's. For instance circles may appear as ovals and colours especially red and will be much duller.

Dear Editor
I am 13 years old and I own a VIC 20. At the School I attend, rumours are going about that you might be discontinuing the VIC. Will you carry on with software?

Chris Gregg
Orpington
Kent

Our magazine is in fact totally independent of Commodore, the manufacturers of the 64 and the VIC 20.

However we do know that Commodore are not producing the VIC 20 computer in the UK any more, but will continue to produce software for it. They know that many people like yourself still have VIC 20's and will of course want new good quality software.

Dear Editor
Is there any way that a VIC 20 game such as Snooker by Visions Software factory, which needs 3K expansion, can run on a 16K expanded VIC 20? Or does it need a program to run properly?

A J Larner
High Wycombe
Bucks

Any VIC 20 game which specifically requires 3K expansion is unlikely to operate with any other expansion, 16K or otherwise. (Unless of course the casette states that it will.) In this case Snooker only works with a 3K expansion.

THE ADDRESS TO WRITE TO IS:
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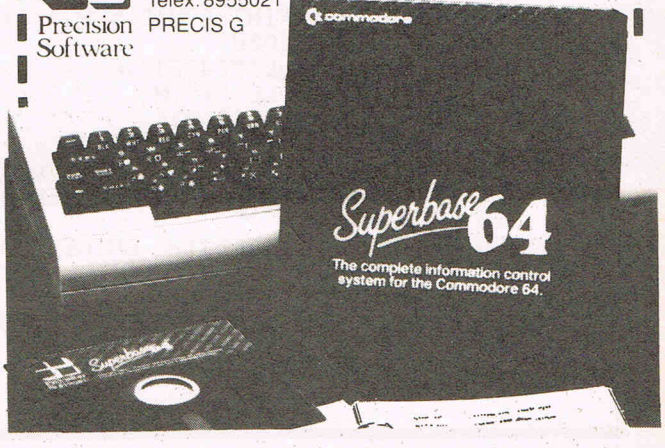

Figure it out

This month we have a program written by MIKE HURD called Maths Quiz. This program was written for his young children to help them with the basic maths functions of Addition, Subtraction, Multiplication and Division.

Maths Quiz was written for the Commodore 64 and tests you on 10 calculations in your chosen topic.

If they are too easy, Mr Hurd says that they can be made harder by simply changing the program at the required places.

```
 1 POKE53280,6:POKE53281,3:PRINT"[CLS]":PRINTTAB(13)"[7CD][BLK]**************"
 3 PRINTTAB(13)"* MATHS QUIZ *":PRINTTAB(13)"*[12SPC]*"
 5 PRINTTAB(13)"*[5SPC]BY[5SPC]*":PRINTTAB(13)"*[12SPC]*"
 7 PRINTTAB(13)"* MIKE HURD[2SPC]*":PRINTTAB(13)"**************":FORX=1TO5000:NE
XTX
 10 P=0:W=0:PRINT"[CLS][2CD]PLEASE ENTER YOUR NAME":INPUTNAME$
 20 POKE53281,3:PRINT"[CLS][BLK][CD][12CR][REV]ENTER SUBJECT:-[OFF]"
 30 PRINT"[2CD][CR]ADDITION [7G<@] 'A'",,"[CD][CR]SUBTRACTION [4G<@] 'S'"
 40 PRINT"[CD][CR]MULTIPLICATION [G<@] 'M'",,"[CD][CR]DIVISION [7G<@] 'D'"
 50 PRINT"[2CD][CR]****************************************"
 60 PRINT"[2CD][CR]PRESS 'R' FOR NEW PLAYER":PRINT"[CD][CR]PRESS 'G' FOR GUESSIN
G GAME"
 70 PRINT"[CD][CR]PRESS 'H' TO SWITCH ON SOUND":PRINT"[CD][CR]PRESS 'L' TO SWITC
H OFF SOUND"
 80 GETC$:IFC$=""THEN80
 90 IFC$="A"THENGOSUB5000:GOTO200
 100 IFC$="S"THENGOSUB5000:GOTO400
 110 IFC$="M"THENGOTO600
 120 IFC$="D"THENGOSUB1000:GOTO800
 130 IFC$="L"THENPOKE54296,0:GOTO80
 140 IFC$="H"THENPOKE54296,10:GOTO80
 150 IFC$="R"THENGOTO10
 160 IFC$="G"THENGOTO8000
 170 IFC$<>"+"ORC$<>"-"ORC$<>"*"ORC$<>"/"ORC$<>"L"ORC$<>"H"ORC$<>"G"THEN80
 180 IFC$<>"G"THEN80
 199 REM *********   ADDITION   *********
 200 GOSUB1000:POKE53281,6
 210 N=INT(RND(0)*HF)+1:M=INT(RND(0)*LF)+1:B=0:J=0
 220 IFM>NTHENGOTO210
 230 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
 240 IFJ=>1THENPRINT"[CU][15CR]";J+1;"TRIES"
 250 Q=N+M:GOSUB6000
 260 PRINTTAB(23-L)"[4CD]";N
 270 PRINTTAB(22-LL)"+";M
 280 PRINTTAB(18)"[6G>*]"
 290 A=0:PRINTTAB(22-LA):INPUTA
 300 IFA=N+MTHENGOSUB4000:GOSUB2000:GOTO210
 310 IFJ<3THENGOSUB3000:IFJ>2THENGOSUB330:GOTO210
 320 GOTO230
 330 B=N+M:PRINT"[2CD]THE ANSWER TO ";N;"+";M;"=";B:FORX=1TO3500:NEXTX:RETURN
 399 REM ********  SUBTRACTION  *********
 400 GOSUB1000:POKE53281,6
 410 N=INT(RND(0)*HF)+1:M=INT(RND(0)*LF)+1:B=0:J=0
```

```
 420 IFM>NTHENGOTO410
 430 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
 440 IFJ=>1THENPRINT"[CU][15CR]";J+1;"TRIES"
 450 Q=N-M:GOSUB6000
 460 PRINTTAB(23-L)"[4CD]";N
 470 PRINTTAB(22-LL)"-";M
 480 PRINTTAB(18)"[6G>*]"
 490 A=0:PRINTTAB(22-LA):INPUTA
 500 IFA=N-MTHENGOSUB4000:GOSUB2000:GOTO410
 510 IFJ<3THENGOSUB3000:IFJ>2THENGOSUB530:GOTO410
 520 GOTO430
 530 B=N-M:PRINT"[2CD]THE ANSWER TO ";N;"-";M;"=";B:FORX=1TO3500:NEXTX:RETURN
 599 REM ******  MULTIPLICATION  ********
 600 POKE53281,6:PRINT"[CLS][2CD][WHT][REV]SELECT TABLES YOU REQUIRE (2-12)";INP
UT"[3CD]";M
 610 IFM<2ORM>12THENGOTO600
 620 GOSUB1000
 630 N=INT(RND(1)*12)+1:B=0:J=0
 640 PRINT"[CLS][CD][2CR]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
 650 Q=N*M:IFM>NTHENGOSUB7000:GOTO710
 660 Q=N*M:GOSUB6000
 670 PRINTTAB(23-L)"[4CD]";N
 680 PRINTTAB(22-LL)"*";M
 690 PRINTTAB(18)"[6G>*]"
 700 A=0:PRINTTAB(22-LA):INPUTA
 710 IFA=M*NTHENGOSUB4000:GOSUB2000:GOTO630
 720 IFJ<3THENGOSUB3000
 730 IFJ>2THENGOSUB750:GOTO630
 740 GOTO640
 750 B=N*M:PRINT"[2CD]THE ANSWER TO ";M;"*";N;"=";B:FORX=1TO3500:NEXTX:RETURN
 799 REM *********  DIVISION  ***********
 800 POKE53281,6
 810 N=INT(RND(1)*144)+1:M=INT(RND(1)*12)+1
 820 IFM>NTHENGOTO800
 830 B=N/M:IFB>12THENGOTO810
 840 IFB<>INT(N/M)THENGOTO810
 850 B=0:J=0
 860 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[7CR]";J+1;"TRY[8CR]WRONG";W
 870 IFJ=>1THENPRINT"[CU][15CR]";J+1;"TRIES"
 880 PRINT"[5CD][4CR]WHAT IS ";N;"/";M;"="
 890 A=0:INPUT"[HOM][7CD][23CR]";A
 900 IFA=N/MTHENGOSUB4000:GOSUB2000:GOTO800
 910 IFJ<3THENGOSUB3000
 920 IFJ>2THENGOSUB940:GOTO800
 930 GOTO860
 940 B=N/M:PRINT"[2CD]THE ANSWER TO ";N;"/";M;"=";B:FORX=1TO3500:NEXTX:RETURN
 999 REM ********************************
1000 PRINT"[CLS][5CD][11CR]HELLO ";NAME$
1010 PRINT"[4CD][6CR]I HAVE TEN QUESTIONS FOR YOU":FORX=1TO2000:NEXTX:RETURN
1999 REM ********************************
2000 P=P+1:PRINT"[4CD][4CR]WELL DONE ";NAME$:FORX=1TO1100:NEXTX:IFP<10THENRETUR
N
2010 PRINT"[CLS][CD][2CR][WHT]RIGHT";P;"[20CR]WRONG";W
2020 W=W+1:J=P/W*10:PRINT"[7CD][11CR]YOUR SCORE=";INT(J)
2030 PRINT"[8CD][2CR]PRESS 'M' FOR MENU"
2040 IFA=M*NTHENPRINT"[CD][2CR]PRESS 'T' FOR TABLES"
2050 P=0:W=0:J=0:PRINT"[CD][2CR]PRESS 'Y' TO CONTINUE"
2060 IFA=N+MORA=N-MTHENPRINT"[CD][2CR]PRESS 'V' FOR NEW VALUES"
2070 GETA$:IFA$=""THEN2070
2080 IFA$="M"THENGOTO20
2090 IFA$="Y"THENPRINT"[CLS]":RETURN
2100 IFA$="T"THENGOTO600
```

```
 2110 IFA$="V"ANDA=N+MTHENGOSUB5000:GOTO200
 2120 IFA$="V"ANDA=N-MTHENGOSUB5000:GOTO400
 2130 IFA$<>"M"ORA$<>"Y"ORA$<>"T"ORA$<>"U"ORA$<>"V"THEN2070
 2999 REM ******** WRONG ****************
 3000 PRINT"[CLS][5CD]":W=W+1:J=J+1:PRINTTAB(10)"SORRY! WRONG":PRINTTAB(11)"[CD]
";A;"?"
 3010 FORK=1TO7:POKE54276,17:POKE54277,8:POKE54278,200:POKE54273,75:POKE54272,25
 3020 FORZ=1TO70:NEXTZ:POKE54273,50:POKE54272,200:FORZ=1TO70:NEXTZ
 3030 POKE54276,0:NEXTK:FORX=1TO1000:NEXTX:RETURN
 3999 REM ******* RIGHT ****************
 4000 POKE53280,1:FORK=5TO30:POKE54276,33:POKE54277,8:POKE54278,8:POKE54273,K
 4010 POKE54272,250-K:FORZ=1TO30:NEXTZ:POKE54276,0:NEXTK:POKE53280,6:RETURN
 4999 REM ********* VALUES **************
 5000 P=0:POKE53281,3:PRINT"[CLS][2CD][BLK]ENTER HIGHEST FIGURE (10-1000)"
 5010 INPUT"[CD][4CR]";HF:IFHF>1000ORHF<10THENGOTO5000
 5020 PRINT"[CLS][2CD]ENTER LOWEST FIGURE (9-999)"
 5030 INPUT"[CD][4CR]";LF:IFLF>999ORLF<9THENGOTO5020:RETURN
 5999 REM **** NUMBER POSITION **********
 6000 LETX=N
 6010 X$=STR$(X)
 6020 L=LEN(X$)
 6030 LETY=M
 6040 X$=STR$(Y)
 6050 LL=LEN(X$)
 6060 LETZ=Q
 6070 X$=STR$(Z)
 6080 LA=LEN(X$)
 6090 RETURN
 6999 REM ****** REVERSE NUMBER *********
 7000 LETY=M
 7010 X$=STR$(Y)
 7020 L=LEN(X$)
 7030 PRINTTAB(23-L)"[4CD]";M
 7040 LETY=N
 7050 X$=STR$(Y)
 7060 L=LEN(X$)
 7070 PRINTTAB(22-L)"*";N
 7080 PRINTTAB(18)"[6G>*]"
 7090 LETY=Q
 7100 X$=STR$(Y)
 7110 L=LEN(X$)
 7120 A=0:PRINTTAB(22-L):INPUTA
 7130 RETURN
 8000 REM ********* GAME ****************
 8010 POKE53281,7:POKE53280,6:PRINT"[CLS][2CD][5CR][BLK]*** NUMBER GUESSING GAME
 ***"
 8020 INPUT"[3CD][3CR]ENTER UPPER LIMIT FOR GUESS";LI
 8030 NM=INT(LI*RND(1))+1:CN=0:PRINT"[CLS][4CD]I'VE GOT THE NUMBER"
 8040 INPUT"[CD][CR]WHAT IS YOUR GUESS";GU:CN=CN+1
 8050 IFGU>NMTHENPRINT"[CD][CR]MY NUMBER IS LOWER":PRINT:GOTO8040
 8060 IFGU<NMTHENPRINT"[CD][CR]MY NUMBER IS HIGHER":PRINT:GOTO8040
 8070 IFGU=NMTHENGOSUB4000:PRINT"[2CD][2CR]GREAT YOU GOT MY NUMBER ";NAME$
 8080 PRINT"[2CD][2CR]IN ONLY";CN;"GUESSES.":PRINT
 8090 IFCN<2THENPRINT"[HOM][12CD][2CR]IN ONLY";CN;"GUESS.[3SPC]":PRINT
 8100 FORX=1TO5000:NEXTX
 8110 PRINT"[CLS][8CD][5CR]PRESS 'Y' TO CONTINUE":PRINT"[CD][5CR]PRESS 'M' FOR M
ENU"
 8120 GETA$:IFA$=""THEN8120
 8130 IFA$="Y"THENGOTO8000
 8140 IFA$="M"THENGOTO20
 8150 IFA$<>"Y"ORA$<>"M"THEN8120
READY.
```

On a printing note...

Dr Jethro Hill of Joreth Music has supplied us with this program to copy one or four screens simultaneously from the 64 to a 7-row dot matrix printer such as the MPS 801. User defined characters are permitted and the full 8x8 dot screen resolution is maintained.

Unlike me, you probably purchased your printer with an instruction book or at least some idea of its specification. (Un)fortunately, I was given an offer I could not refuse for the MPS 801 without any book or information at all. It soon dawned on me after playing around with it for a little while that it was only a 7 row matrix printer and thus some problems lay ahead in copying the character based screen graphics I had devised for music transcription system.

Undaunted I persevered and in due course I obtained a user's manual and realised that with the use of the graphics mode (and a pinch of byte manipulation) I could map the 8x8 screen patterns into the awkward base 7 format.

I had already thought of using multiple screens to retain musical stave patterns, since the screen resolution of the 64 only permitted the display of half a line of standard double stave piano music with sufficient quality. The MPS 801 confirmed this format since if I printed them sideways fours screens would fit neatly on a single sheet. Each sheet could then handle two complete lines of piano music.

How it works

To print a screen sideways on a printer is not difficult. It requires that you start at the bottom left hand corner and work up the screen in columns while printing in rows. However if you were to do this on the 64 by merely reading the character byte by byte from its code memory and translating it directly to, suppose, a pseudo 8-row matrix printer with the same facilities as the MPS 801, then the characters, although correctly placed and rotated, would be mirror images of the real things! This is because the first row to the printer is the least significant bit while the last column of the character pattern byte is the least significant. The same is true even if mapping to a 7-row printer; thus the first thing to do with every character pattern byte is to reverse it:

B[76543210] --> B[01234567]
or
B --> RVS(B)

To output the first line to the printer is then easy: starting at the bottom left corner we look up the code number of the character there. From this the location of its pattern bytes can be calculated. Working backwards through these bytes, we simply reverse them, discard the 8th bits and/or each with $80 to give the correct MPS 801 graphic data format. The same procedure applies to all the characters found as we climb the leftmost column.

The next column is a touch trickier: we read the character upwards as before, reverse them, but this time we include the discarded 8th bits from the characters in the first column. These bits will become the new 1st bits of the second column output bytes, the remainder being filled by a shift left one bit of the first 6 bits of the present character pattern byte. A final setting of the 8th bit of the output byte to "1" completes the required graphic data byte and the procedure is again repeated for every character up the column.

Note that the 6-column format of the matrix printer does not matter any more since the data is just a continuous stream of bytes in that direction.

I could go on explaining verbally the output of each byte but I think it is probably clear that every subsequent column gives progressively one more discarded byte to handle in the next column until, at the seventh column, we have to handle 7 bits entirely from the previous column. These are handled as before and eight lines of 7-row characters have been output for 7 columns of 8 bit wide characters.

Table 1 indicates how we must combine the reversed pattern bytes to obtain graphic data bytes.

Output Line	*Screen Column*	*Present Byte*	*Previous Byte*	c
1	1	[6543210]	–	0
2	2	[543210]	[7]	1
3	3	[43210]	[76]	2
4	4	[3210]	[765]	3
5	5	[210]	[7654]	4
6	6	[10]	[76543]	5
7	7	[0]	[765432]	6
8	7	–	[7654321]	7

Table 1

The mathematically minded among you will recognise that the formula for the cth required output graphic byte is:

0(c) = $80 AND [LSR([8-c]times)
of (RVS(Bprev))]
OR
[ASL(c times) of (RVS(BPres))]

where ASL and LSR are left and right shift one bit operators.

After the seventh screen column we merely go throughout the procedure again until the last column is reached, where we must be careful not to read from the forbidden area beyond it.

The four screen case is similar but allowances must be made for gaps between screens, and the correct bottom left corner must be chosen. In the program that follows the screens are assumed to fall consecutively in the normal screen memory locations of the VIC II chip. The program does not allow direct access to the ROM characters (I did not want them) but screens and character memory may be anywhere in any BANK so long as they do not clash with your program and this program. There is no reason in principle why ROM characters cannot be used directly (the sample BASIC

loader and run program uses them indirectly) by using suitable POKEs and PEEKs to look beneath the I/O. If you do, please remember to reinstate the I/O immediately after reading the byte: the printer needs it!

One further refinement: the MPS 801 is none too fast. It only has a 90 byte buffer and it has an irritating way of returning to the start of a line while receiving data after printing a full buffer. This makes printing rather slow, but it is the printer holding things up. Use has been made of repeatable graphic bytes to avoid clogging up the printer's buffer with a queue of identical whenever they occur. An improvement not included here, but left as an exercise to the reader would be to suppress entirely a row of "0" bytes (space) by using only a carriage return.

The program

The machine code occupies 713 bytes from $C000 (49152) to $C2C9 (49865).

It is relocatable but the variables used within remain fixed between $CF00 (52992) and $CF19 (53017) with some use made of the floating point accumulator in zero page between $69 and $70 (105 to 112). (If you do not have the will to type this out, a telephone call to me at Malvern 62158 may secure a cassette copy at a reasonable cost!)

The user has to do four things externally:

1 Select the BANK

2 POKE (start of screens location)/256 at $CF01 (52993)

3 POKE (start of character data)/256 at $CF03 (52995)

4 POKE number of screens (1 or 4) at $CF04 (52996)

The program is then run by a call of SYS (49660) ($C1FC).

Happy printing!

```
100 033C            SCREEN      =  $CF00
120 033C            CHAR        =  $CF02
140 033C            NSCRNS      =  $CF04
160 033C            C           =  $CF05
200 033C            N           =  $CF07
220 033C            CBAR        =  $CF09
240 033C            LMAX        =  $CF0A
260 033C            L           =  $CF0B
280 033C            MMAX        =  $CF0C
300 033C            M           =  $CF0D
320 033C            O           =  $CF0E
340 033C            AA          =  $69
360 033C            BB          =  $6B
380 033C            AAA         =  $6D
400 033C            BBB         =  $6F
420 033C            T1          =  $CF10
440 033C            T2          =  $CF11
460 033C            T3          =  $CF12
480 033C            T4          =  $CF13
500 033C            T5          =  $CF14
503 033C            NEWC        =  $CF15
504 033C            LCHAR       =  $CF17
505 033C            NCHAR       =  $CF18
506 033C            RPCHAR      =  $CF19
510 C000            * = $C000
520 C000 20AEFF INIT          JSR $FFAE      ! UNLISTEN SERIAL BUS
540 C003 A904                 LDA #4
560 C005 20B1FF               JSR $FFB1      ! COMMAND DEV.4 TO LIST
EN
580 C008 A960                 LDA #$60
600 C00A 2093FF               JSR $FF93      ! SET SEC. ADD. TO ZERO
620 C00D A908                 LDA #8
640 C00F 20A8FF               JSR $FFA8      ! OUTPUT BYTE = 8 TO OP
EN GRAPHICS MODE
660 C012 A90D                 LDA #13
670 C014 20A8FF               JSR $FFA8      ! CR
674 C017 A907                 LDA #7
675 C019 8D02CF               STA CHAR
680 C01C A901                 LDA #01
700 C01E 8D05CF               STA C          ! C=1
740 C021 8D07CF               STA N
750 C024 A900                 LDA #0
770 C026 8D08CF               STA N+1        !N=1
782 C029 8D18CF               STA NCHAR
784 C02C 8D19CF               STA RPCHAR
787 C02F 8D00CF               STA SCREEN
800 C032 A908                 LDA #8
820 C034 8D09CF               STA CBAR       ! CBAR=8
840 C037 18                   CLC
860 C038 AD00CF               LDA SCREEN
880 C03B 69C0                 ADC #$C0
```

```
 900 C03D 856B                STA BB
 920 C03F AD01CF              LDA SCREEN+1
 940 C042 6903                ADC #$03
 960 C044 856C                STA BB+1          ! BB=SCREEN+960
 980 C046 A9E8                LDA #$E8
1000 C048 8D0ECF              STA O
1020 C04B A903                LDA #$03
1040 C04D 8D0FCF              STA O+1           ! O = 1000
1060 C050 A928                LDA #40
1080 C052 8D0ACF              STA LMAX          ! LMAX = 40
1100 C055 A918                LDA #24
1120 C057 8D0CCF              STA MMAX          ! MMAX = 24
1140 C05A AD04CF              LDA NSCRNS
1160 C05D C904                CMP #4            ! ARE 4 SCRNS REQUESTED
1180 C05F F001                BEQ FOUR
1200 C061 60                  RTS               ! 1 SCREEN          2.
1220 C062 18      FOUR        CLC               ! 4 SCREENS
1240 C063 A56C                LDA BB+1
1260 C065 6908                ADC #$08
1280 C067 856C                STA BB+1          ! BB= BB+2048
1300 C069 AD0FCF              LDA O+1
1320 C06C 6908                ADC #$08
1340 C06E 8D0FCF              STA O+1           ! O=O+2048
1360 C071 A950                LDA #80
1380 C073 8D0ACF              STA LMAX          ! LMAX=80
1400 C076 A931                LDA #49
1420 C078 8D0CCF              STA MMAX          ! MMAX=49
1440 C07B 60                  RTS
1460 C07C             .! REVERSE A BYTE
1480 C07C             ! ABCDEFGH ---> HGFEDCBA
1500 C07C 8C10CF REVBYT       STY T1
1520 C07F 8E11CF              STX T2            ! TEMP. STORE X & Y
1540 C082 A280                LDX #$80          ! X = 128
1560 C084 A8                  TAY
1580 C085 A900                LDA #$00
1600 C087 8D12CF              STA T3            ! INIT. SUM REGISTER
1620 C08A 98      NXTBYT      TYA
1640 C08B 4A                  LSR A
1660 C08C A8                  TAY               ! EXAMINE NEXT BIT FROM
LEFT
1680 C08D 8A                  TXA
1700 C08E 9007                BCC IGNORE
1720 C090 18                  CLC
1740 C091 6D12CF              ADC T3            ! IF BIT = 1 THEN ADD X
TO SUM
1760 C094 8D12CF              STA T3
1800 C097 8A      IGNORE      TXA
1820 C098 4A                  LSR A
1840 C099 AA                  TAX               ! DIVIDE X BY 2
1860 C09A C900                CMP #$00          ! TEST IF FINISHED
1880 C09C D0EC                BNE NXTBYT
1900 C09E AE11CF              LDX T2
1920 C0A1 AC10CF              LDY T1            ! RELOAD X & Y
1940 C0A4 AD12CF              LDA T3            ! LOAD RESULT IN A
1960 C0A7 60                  RTS
1980 C0A8             ! CALCULATE PRINTER BYTE AND OUTPUT
2000 C0A8 A000    CALC        LDY #$00
2020 C0AA 8C13CF              STY T4
2040 C0AD A200    RET         LDX #$00
2060 C0AF B16D                LDA (AAA),Y
2080 C0B1 207CC0              JSR REVBYT
2120 C0B4 4A      RCBAR       LSR A
2140 C0B5 E8                  INX
2160 C0B6 EC09CF              CPX CBAR          ! ROLL RIGHT CBAR TIMES
2180 C0B9 D0F9                BNE RCBAR
2220 C0BB 0980                ORA #$80
2240 C0BD 8D14CF              STA T5
```

```
2260 C0C0 AE0BCF            LDX L
2280 C0C3 EC0ACF            CPX LMAX
2300 C0C6 D003              BNE SPEC
2320 C0C8 4CDFC0            JMP NORM
2340 C0CB A201    SPEC      LDX #$01
2360 C0CD B16F              LDA (BBB),Y
2365 C0CF 207CC0            JSR REVBYT
2380 C0D2 EC05CF  RPT       CPX C
2400 C0D5 F005              BEQ RLC
2440 C0D7 0A                ASL A
2460 C0D8 E8                INX
2480 C0D9 4CD2C0            JMP RPT          ! ROLL LEFT C TIMES
2500 C0DC 0D14CF  RLC       ORA T5
2520 C0DF 2006C2  NORM      JSR OPBYTS
2540 C0E2 C66D              DEC AAA
2560 C0E4 A9FF              LDA #$FF
2580 C0E6 C56D              CMP AAA
2600 C0E8 D002              BNE SKIP1
2620 C0EA C66E              DEC AAA+1
2640 C0EC C66F    SKIP1     DEC BBB
2660 C0EE A9FF              LDA #$FF
2680 C0F0 C56F              CMP BBB
2700 C0F2 D002              BNE SKIP2
2720 C0F4 C670              DEC BBB+1
2740 C0F6 18      SKIP2     CLC
2760 C0F7 EE13CF            INC T4
2780 C0FA A908              LDA #$08
2800 C0FC CD13CF            CMP T4
2820 C0FF F003              BEQ REVD
2840 C101 4CADC0            JMP RET
2860 C104 60      REVD      RTS
2880 C105         ! SCAN THE SCREEN(S)
2900 C105 A900    SCAN      LDA #0
2920 C107 8D0BCF            STA L
2940 C10A A900    LAB17     LDA #0
2960 C10C 8D0DCF            STA M
2980 C10F AD0DCF  NEXTM     LDA M
3000 C112 C919              CMP #$19
3020 C114 D00D              BNE LAB10
3040 C116 38                SEC
3060 C117 A56B              LDA BB
3080 C119 E918              SBC #$18
3100 C11B 856B              STA BB
3120 C11D A56C              LDA BB+1
3140 C11F E904              SBC #$04
3160 C121 856C              STA BB+1         ! IF M = 25:BB=BB-1048
3180 C123 38      LAB10     SEC
3200 C124 A56B              LDA BB
3220 C126 ED07CF            SBC N
3240 C129 8569              STA AA
3260 C12B A56C              LDA BB+1
3280 C12D ED08CF            SBC N+1
3300 C130 856A              STA AA+1         ! AA=BB-N
3320 C132 18                CLC
3340 C133 A200              LDX #$00
3360 C135 A169    LAB13     LDA (AA,X)
3380 C137 8D10CF            STA T1
3400 C13A 0A                ASL A
3420 C13B 0A                ASL A
3440 C13C 0A                ASL A
3480 C13D 18                CLC
3500 C13E 6D02CF            ADC CHAR
3520 C141 A000              LDY #$00
3540 C143 9001              BCC LAB11
3560 C145 C8                INY
```

```
3580 C146 956D   LAB11      STA AAA,X
3600 C148 AD10CF            LDA T1
3620 C14B 4A                LSR A
3640 C14C 4A                LSR A
3660 C14D 4A                LSR A
3680 C14E 4A                LSR A
3700 C14F 4A                LSR A
3760 C150 C001              CPY #$01
3780 C152 D001              BNE LAB12
3800 C154 38                SEC
3820 C155 6D03CF LAB12      ADC CHAR+1
3840 C158 E8                INX
3860 C159 956D              STA AAA,X
3880 C15B E8                INX
3900 C15C E004              CPX #$04
3920 C15E D0D5              BNE LAB13
3940 C160 20A8C0            JSR CALC
3960 C163 38                SEC
3980 C164 A56B              LDA BB
4000 C166 E928              SBC #$28
4020 C168 856B              STA BB
4040 C16A A56C              LDA BB+1
4060 C16C E900              SBC #$00
4080 C16E 856C              STA BB+1        !BB=BB-40 : NEXT ROW
4120 C170 AD0DCF            LDA M
4140 C173 CD0CCF            CMP MMAX
4160 C176 F006              BEQ ENDM
4180 C178 EE0DCF            INC M
4200 C17B 4C0FC1            JMP NEXTM
4240 C17E 2085C2 ENDM       JSR NEWLINE
4260 C181 AD05CF            LDA C
4280 C184 C908              CMP #8
4300 C186 D010              BNE NEXTC
4320 C188 A901              LDA #1
4340 C18A 8D05CF            STA C
4400 C18D A908              LDA #8
4420 C18F 8D09CF            STA CBAR
4440 C192 CE0BCF            DEC L
4460 C195 4CA8C1            JMP SKIP3
4480 C198 EE05CF NEXTC      INC C
4500 C19B CE09CF            DEC CBAR
4620 C19E E66B              INC BB
4640 C1A0 A900              LDA #0
4660 C1A2 C56B              CMP BB
4680 C1A4 D002              BNE SKIP3
4700 C1A6 E66C              INC BB+1
4720 C1A8 18     SKIP3      CLC
4740 C1A9 A56B              LDA BB
4760 C1AB 6D0ECF            ADC O
4780 C1AE 856B              STA BB
4800 C1B0 A56C              LDA BB+1
4820 C1B2 6D0FCF            ADC O+1
4840 C1B5 856C              STA BB+1        ! BB=BB+O
4860 C1B7 A901              LDA #1
4880 C1B9 8D07CF            STA N
4900 C1BC A900              LDA #0
4920 C1BE 8D08CF            STA N+1         ! N=1
4940 C1C1 AD0BCF            LDA L
4960 C1C4 C927              CMP #$27
4980 C1C6 D017              BNE LAB15
5000 C1C8 A9D9              LDA #$D9
5020 C1CA 8D07CF            STA N
5040 C1CD A903              LDA #$03
5060 C1CF 8D08CF            STA N+1         ! IF L=39: N=985
```

```
5080 C1D2 18                    CLC
5100 C1D3 A56B                  LDA BB
5120 C1D5 69D8                  ADC #$D8
5140 C1D7 856B                  STA BB
5160 C1D9 A56C                  LDA BB+1
5200 C1DB 856C                  STA BB+1        ! IF L=39: BB=BB+984
5220 C1DF AD0BCF LAB15          LDA L
5240 C1E2 CD0ACF                CMP LMAX
5260 C1E5 F006                  BEQ LAB16
5280 C1E7 EE0BCF                INC L
5300 C1EA 4C0AC1                JMP LAB17
5310 C1ED 60     LAB16          RTS
5320 C1EE A90D   FINI           LDA #13
5340 C1F0 20A8FF                JSR $FFA8       ! PRINT CR
5360 C1F3 A90F                  LDA #$0F
5380 C1F5 20A8FF                JSR $FFA8       ! RESET PRINTER TO NORM
AL
5400 C1F8 20AEFF                JSR $FFAE       ! UNLISTEN SERIAL BUS
5420 C1FB 60                    RTS
5440 C1FC 2000C0 SCRIPT         JSR INIT
5460 C1FF 2005C1                JSR SCAN
5480 C202 20EEC1                JSR FINI
5490 C205 60                    RTS             !RETURN TO BASIC
5495 C206 8E11CF OPBYTS         STX T2
5500 C209 8D15CF                STA NEWC
5520 C20C AE18CF                LDX NCHAR
5540 C20F E000                  CPX #0
5560 C211 D00E                  BNE NOTFIRST
5580 C213 8D17CF                STA LCHAR
5600 C216 E8                    INX
5620 C217 8E18CF                STX NCHAR
5640 C21A 8E19CF                STX RPCHAR
5650 C21D AE11CF                LDX T2
5660 C220 60                    RTS
5680 C221 CD17CF NOTFIRST       CMP LCHAR
5700 C224 D021                  BNE NEWCH
5720 C226 EE19CF                INC RPCHAR
5740 C229 A200                  LDX #0
5760 C22B EC19CF                CPX RPCHAR
5780 C22E D013                  BNE SKIP4
5800 C230 EE19CF                INC RPCHAR
5820 C233 A91A                  LDA #26
5840 C235 20A8FF                JSR $FFA8
5860 C238 A9FF                  LDA #255
5880 C23A 20A8FF                JSR $FFA8
5900 C23D AD17CF                LDA LCHAR
5920 C240 20A8FF                JSR $FFA8
5930 C243 AE11CF SKIP4          LDX T2
5940 C246 60                    RTS
5941 C247 AE19CF NEWCH          LDX RPCHAR
5942 C24A AD17CF                LDA LCHAR
5943 C24D E000                  CPX #0
5944 C24F F022                  BEQ N3
5945 C251 E002                  CPX #2
5946 C253 D009                  BNE N4
5947 C255 20A8FF                JSR $FFA8
5948 C258 20A8FF N5             JSR $FFA8
5949 C25B 4C73C2                JMP N3
5950 C25E E001   N4              CPX #1
5951 C260 F0F6                  BEQ N5
5952 C262 A91A                  LDA #26
5953 C264 20A8FF                JSR $FFA8
```

```
5954 C267 AD19CF             LDA RPCHAR
5955 C26A 20A8FF             JSR $FFA8
5956 C26D AD17CF             LDA LCHAR
5957 C270 20A8FF             JSR $FFA8
6000 C273 AD15CF N3          LDA NEWC
6020 C276 8D17CF             STA LCHAR
6040 C279 A901               LDA #1
6060 C27B 8D19CF             STA RPCHAR
6070 C27E AE11CF             LDX T2
6080 C281 60                 RTS
6090 C282 8E11CF             STX T2
6100 C285 A900   NEWLINE     LDA #0
6120 C287 8D18CF             STA NCHAR
6140 C28A AD17CF             LDA LCHAR
6150 C28D C500               CMP $0
6160 C28F D009               BNE NZCHARS
6180 C291 A90D   NOWT        LDA #13
6200 C293 20A8FF             JSR $FFA8
6210 C296 AE11CF             LDX T2
6220 C299 60                 RTS
6240 C29A AE19CF NZCHARS     LDX RPCHAR
6260 C29D AD17CF             LDA LCHAR
6280 C2A0 E000               CPX #0
6300 C2A2 F0ED               BEQ NOWT
6320 C2A4 E002               CPX #2
6340 C2A6 D009               BNE N1
6360 C2A8 20A8FF             JSR $FFA8
6380 C2AB 20A8FF N2          JSR $FFA8
6400 C2AE 4C91C2             JMP NOWT
6420 C2B1 E001   N1          CPX #1
6440 C2B3 F0F6               BEQ N2
6460 C2B5 A91A               LDA #26
6480 C2B7 20A8FF             JSR $FFA8
6500 C2BA AD19CF             LDA RPCHAR
6520 C2BD 20A8FF             JSR $FFA8
6530 C2C0 AD17CF             LDA LCHAR
6535 C2C3 20A8FF             JSR $FFA8
6540 C2C6 4C91C2             JMP NOWT
```

```
10 PL=49152: PH=49865: SC=49660: SN=52992: CH=52994: NS=52996: CL=10240
20 FOR PR=PL TO PH: READA: POKE PR,A: NEXT
30 PRINT CHR$(142): POKE 52,40:POKE 56,40
40 POKE 56334,PEEK(56334)AND254: POKE 1,PEEK(1)AND251
50 FOR I=0 TO 2047: POKE I+CL,PEEK(I+53248): NEXT
60 POKE 1,PEEK(1)OR4: POKE 56334,PEEK(56334)OR1
70 SB=1024: S=SB/256: C=CL/256
80 POKE SN+1,S: POKE CH+1,C: POKE NS,1
90 GOSUB 500
100 SYS(SC)
110 SL=10240+2048: S=SL/256: POKE SN+1,S
120 POKE NS,4
130 FOR A=192 TO 240 STEP 16: POKE 53272,(PEEK(53272)AND15)ORA: POKE 648,A/4
140 SB=64*A
150 GOSUB 500
160 PRINT "■■SCREEN WITH A=";A
170 NEXT A
180 SYS(SC)
```

```
190 POKE 53272,(PEEK(53272)AND15)OR16: POKE 648,4
210 END
500 PRINT "■■    ASCII CODE TABLE"
510 FOR I=0 TO 32: POKE SB+120+I,67: POKE 55416+I,1: NEXT
520 FOR I=0 TO 17: POKE SB+81+40*I,66: POKE 55377+40*I,1: NEXT: POKE SB+121,91
530 A$= "0 1 2 3 4 5 6 7 8 9 A B C D E F "
540 PRINT "■■■■"A$
550 PRINT: FOR I=1 TO 31 STEP 2: PRINT MID$(A$,I,1): NEXT
560 S=SB+162: CO=55458
570 FOR I=0 TO 15: FOR J=0 TO 30 STEP 2: Z=J/2
580 C=Z*16+I: P=40*I+J: POKE S+P,C: POKES+P+1,32: POKE CO+P,1: POKE CO+P+1,1
590 NEXT: NEXT: RETURN
1000 DATA 32,174,255,169,4,32,177,255,169,96,32,147,255,169,8,32
1010 DATA 168,255,169,13,32,168,255,169,7,141,2,207,169,1,141,5
1020 DATA 207,141,7,207,169,0,141,8,207,141,24,207,141,25,207,141
1030 DATA 0,207,169,8,141,9,207,24,173,0,207,105,192,133,107,173
1040 DATA 1,207,105,3,133,108,169,232,141,14,207,169,3,141,15,207
1050 DATA 169,40,141,10,207,169,24,141,12,207,173,4,207,201,4,240
1060 DATA 1,96,24,165,108,105,8,133,108,173,15,207,105,8,141,15
1070 DATA 207,169,80,141,10,207,169,49,141,12,207,96,140,16,207,142
1080 DATA 17,207,162,128,168,169,0,141,18,207,152,74,168,138,144,7
1090 DATA 24,109,18,207,141,18,207,138,74,170,201,0,208,236,174,17
1100 DATA 207,172,16,207,173,18,207,96,160,0,140,19,207,162,0,177
1110 DATA 109,32,124,192,74,232,236,9,207,208,249,9,128,141,20,207
1120 DATA 174,11,207,236,10,207,208,3,76,223,192,162,1,177,111,32
1130 DATA 124,192,236,5,207,240,5,10,232,76,210,192,13,20,207,32
1140 DATA 6,194,198,109,169,255,197,109,208,2,198,110,198,111,169,255
1150 DATA 197,111,208,2,198,112,24,238,19,207,169,8,205,19,207,240
1160 DATA 3,76,173,192,96,169,0,141,11,207,169,0,141,13,207,173
1170 DATA 13,207,201,25,208,13,56,165,107,233,24,133,107,165,108,233
1180 DATA 4,133,108,56,165,107,237,7,207,133,105,165,108,237,8,207
1190 DATA 133,106,24,162,0,161,105,141,16,207,10,10,10,24,109,2
1200 DATA 207,160,0,144,1,200,149,109,173,16,207,74,74,74,74,74
1210 DATA 192,1,208,1,56,109,3,207,232,149,109,232,224,4,208,213
1220 DATA 32,168,192,56,165,107,233,40,133,107,165,108,233,0,133,108
1230 DATA 173,13,207,205,12,207,240,6,238,13,207,76,15,193,32,133
1240 DATA 194,173,5,207,201,8,208,16,169,1,141,5,207,169,8,141
1250 DATA 9,207,206,11,207,76,168,193,238,5,207,206,9,207,230,107
1260 DATA 169,0,197,107,208,2,230,108,24,165,107,109,14,207,133,107
1270 DATA 165,108,109,15,207,133,108,169,1,141,7,207,169,0,141,8
1280 DATA 207,173,11,207,201,39,208,23,169,217,141,7,207,169,3,141
1290 DATA 8,207,24,165,107,105,216,133,107,165,108,105,3,133,108,173
1300 DATA 11,207,205,10,207,240,6,238,11,207,76,10,193,96,169,13
1310 DATA 32,168,255,169,15,32,168,255,32,174,255,96,32,0,192,32
1320 DATA 5,193,32,238,193,96,142,17,207,141,21,207,174,24,207,224
1330 DATA 0,208,14,141,23,207,232,142,24,207,142,25,207,174,17,207
1340 DATA 96,205,23,207,208,33,238,25,207,162,0,236,25,207,208,19
1350 DATA 238,25,207,169,26,32,168,255,169,255,32,168,255,173,23,207
1360 DATA 32,168,255,174,17,207,96,174,25,207,173,23,207,224,0,240
1370 DATA 34,224,2,208,9,32,168,255,32,168,255,76,115,194,224,1
1380 DATA 240,246,169,26,32,168,255,173,25,207,32,168,255,173,23,207
1390 DATA 32,168,255,173,21,207,141,23,207,169,1,141,25,207,174,17
1400 DATA 207,96,142,17,207,169,0,141,24,207,173,23,207,197,0,208
1410 DATA 9,169,13,32,168,255,174,17,207,96,174,25,207,173,23,207
1420 DATA 224,0,240,237,224,2,208,9,32,168,255,32,168,255,76,145
1430 DATA 194,224,1,240,246,169,26,32,168,255,173,25,207,32,168,255
1440 DATA 173,23,207,32,168,255,76,145,194,0

READY.
```

Floating advice

The floating point storage of numbers on Commodore computers is very complicated to understand but the use of the routines from machine code is fairly easy. Richard Franklin gives basic commands and their equivalent methods from machine code.

The first routines to describe are those that transfer constants from memory into the floating point accumulators (FAC's). These routines will transfer a FAC to memory packing the sign bit into the msb of the mantissa or transferring memory into a FAC unpacking the sign bit from the msb into it's separate byte.

Transfer FAC#1 to memory
This routine will unload the contents of FAC#1 into a memory location pointed to by the index registers. .X(low order) and .Y(high order).

Computer	*Entry Point*
CBM 64	$BBD4.
VIC 20	$DBD4.
PET Bas 4	$CD0A.
PET Bas 2	$DAE0.
PET Bas 1	$DAA6.

For example to transfer the FAC#1 into memory at location $C000 on the 64:

```
LDX     #$00.
LDY     #$C0.
JSR     $BBD4.
```

Transfer memory to FAC#1
This routine will load FAC#1 with the contents of memory pointed to by the registers .A(low order) and .Y(high order).

Computer	*Entry Point*
CBM 64	$BBA2.
VIC 20	$DBA2.
PET Bas 4	$CCD8.
PET Bas 2	$DAAE.
PET Bas 1	$DA74.

For example to transfer memory at location $C000 to FAC#1 on the 64:

```
LDA     #$00.
LDY     #$C0.
JSR     $BBA2.
```

Transfer memory to FAC#2
This routine does the same as transfer memory to FAC#1 with the same pointer registers.

Computer	*Entry Point*
CBM 64	$BA8C.
VIC 20	$DA8C.
PET Bas 4	$CBC2.
PET Bas 2	$D998.
PET Bas 1	$D95E.

Example:

```
LDA     #$00.
LDY     #$C0.
JSR     $BA8C.
```

N.B. To transfer FAC#2 to memory, FAC#2 must first be transferred to FAC#1 and then FAC#1 to memory.

The next routines are the ones that transfer one FAC to the other.

Transfer FAC#1 to FAC#2
This routine will copy the contents of FAC#1 to FAC#2.

Computer	*Entry Point*
CBM 64	$BC0F.
VIC 20	$DC0F.
PET Bas 4	$CD45.
PET Bas 2	$DB1B.
PET Bas 1	$DAE1.

Example:

```
JSR     $BC0F.
```

Transfer FAC#2 to FAC#1
This routine will copy the contents of FAC#2 to FAC#1.

Computer	*Entry Point*
CBM 64	$BBFC.
VIC 20	$DBFC.
PET Bas 4	$CD32.
PET Bas 2	$DB08.
PET Bas 1	$DACE.

Example:

```
JSR     $BBFC.
```

The arithmetic routines
There are several routines for arithmetic that use the FAC's. These will be explained

now. All the entry points listed are those where it is assumed that both FAC's have already been loaded with the values.

Perform add.
This routine adds the contents of FAC#1 to FAC#2 and stores the result in FAC#1.

Computer	*Entry Point*
CBM 64	$B86F.
VIC 20	$D86F.
PET Bas 4	$C9A0.
PET Bas 2	$D776.
PET Bas 1	$D73F.

Example:
load FAC's 1 & 2 as previous.
JSR $B85F.

Perform subtract
This routine subtracts the contents of FAC#1 from FAC#2 and stores the result in FAC#1.

Computer	*Entry Point*
CBM 64	$B853.
VIC 20	$D853.
PET Bas 4	$C989.
PET Bas 2	$D736.
PET Bas 1	$D728.

Example:
load FAC's 1 & 2 as previous.
JSR $B853.

Perform multiply
This routine multiplies the contents of FAC#1 to FAC#2 and stores the result in FAC#1.

Computer	*Entry Point*
CBM 64	$BA30.
VIC 20	$DA30.
PET Bas 4	$CB66.
PET Bas 2	$D93C.
PET Bas 1	$D902.

Example:
load FAC's 1 & 2 as previous.
JSR $BA30.

Perform divide
This routine divides the contents of FAC#2 by FAC#1 and stores the result in FAC#1. .A must be loaded with the exponent of FAC#1.

Computer	*Entry Point*
CBM 64	$BB12.
VIC 20	$DB12.
PET Bas 4	$CC4A.
PET Bas 2	$DA20.
PET Bas 1	$D9E6.

Example:
load FAC's 1 and 2 as previous.
LDA $61.
JSR $BB12.

Calculate SIN
This routine calculates the sine of the value stored in FAC#1 and puts the result in FAC#1.

Computer	*Entry Point*
CBM 64	$E26B.
VIC 20	$E268.
PET Bas 4	$D289.
PET Bas 2	$DFDF.
PET Bas 1	$DFA5.

Example:
load FAC#1 with the value in radians.
JSR $E26B.

Calculate COS
This routine calculates the cosine of the value stored in FAC#1 and puts the result in FAC#1. The routine actually adds PI/2 to the value and then calculates the sine.

Computer	*Entry Point*
CBM 64	$E264.
VIC 20	$E261.
PET Bas 4	$D282.
PET Bas 2	$DFD8.
PET Bas 1	$DF9E.

Example:
load FAC#1 with the value in radians.
JSR $E264.

Calculate TAN
This routine calculates the tangent of the value stored in FAC#1 and puts the result in FAC#1. The routine actually divides the sine of the value by the cosine of the value.

Computer	*Entry Point*
CBM 64	$E2B4.
VIC 20	$E2B1.
PET Bas 4	$D2D2.
PET Bas 2	$E028.
PET Bas 1	$DFEE.

Example:
load FAC#1 with the value in radians.
JSR $E2B4.

Calculate ATN
This routine calculates the arc-tangent of a value stored in FAC#1 and puts the result in radians in FAC#1.

Computer	*Entry Point*
CBM 64	$E30E.
VIC 20	$E30B.
PET Bas 4	$D32C.
PET Bas 2	$E08C.
PET Bas 1	$E048.

Example:
load FAC#1 with the value.
JSR $E30E.

Calculate EXP
This routine calculates the exponent of the value in FAC#1 and stores the result in FAC#1.

Computer	*Entry Point*
CBM 64	$BFED.
VIC 20	$DFED.
PET Bas 4	$D184.
PET Bas 2	$DEDA.
PET Bas 1	$DEA0.

Example:
load FAC#1 with the value.
JSR $BFED.

Calculate LOG
This routine calculates the logarithm of the value stored in FAC#1 and puts the result in FAC#1.

Computer	*Entry Point*
CBM 64	$B9EA.
VIC 20	$D9EA.
PET Bas 4	$CB20.
PET Bas 2	$D8F6.
PET Bas 1	$D8BF.

Calculate power
This routine calculates the result of FAC#2 to the power of FAC#1 and puts the result in FAC#1. .A must be loaded with the exponent of FAC#1.

Computer	*Entry Point*
CBM 64	$BF7B.
VIC 20	$DF7B.
PET Bas 4	$D112.
PET Bas 2	$DE68.
PET Bas 1	$DE2E.

Example:
load FAC#2 with number.
load FAC#1 with power.
LDA $61
JSR $BF7B.

Calculate SQR
This routine calculates the square root of the value in FAC#1 and puts the result in FAC#1. The routine actually calculates FAC#1 to the power 0.5.

Computer	*Entry Point*
CBM 64	$BF71.
VIC 20	$DF71.
PET Bas 4	$D108.
PET Bas 2	$DE5E.
PET Bas 1	$DE24.

Example:
load FAC#1 with the value.
JSR $BF71.

CURSOR CHARACTERS

■ - By pressing the cursor down key
■ - By pressing the cursor down key with the shift key
■ - By pressing the cursor right key
■ - By pressing the cursor right key with the shift key
■ - By pressing the home key
■ - By pressing the home key with the shift key
■ - By pressing the control key and key 1
■ - key 2
■ - key 3
■ - key 4
■ - key 5
■ - key 6
■ - key 7
■ - key 8
■ - By pressing the CBM key with key 1
■ - key 2
■ - key 3 ■ - By pressing key F1
■ - key 4 ■ - By pressing key F2
■ - key 5 ■ - By pressing Key F3
■ - key 6 ■ - By pressing key F4
■ - key 7 ■ - By pressing key F5
■ - key 8 ■ - By pressing key F6
■ - By pressing the control key and key 9 ■ - By pressing key F7
■ - key 0 ■ - By pressing key F8

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A superior adaptor at a reasonable price. This brand-new item allows you to use standard CBM/PET IEEE disk drives and printers with your VIC or 64. Many advanced features including:

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JCL SOFTWARE
47 London Road, Southborough, Tunbridge Wells, Kent

Phone 0892-27454 for data-sheets or contact your nearest Commodore dealer.

Storage

A 'unique' flip 'n' file disk storage system has been independently announced by two different companies.

ISA Gold's storage system caters for up to 15 5.25 inch disks. A fanned out easel position allows easy retrieval of disks without bending during selection. A perspex window allow the files to be visible even when the file is closed.

Other features include a hand grip, four anti-slip grips and a range of self-adhesive labels for indexing and archive filing. The product costs £5.95 (plus VAT).

ACS's Flip 'n' File system is available in three sizes. The Minibox takes 15 disks and there are two versions of the Keybox, which incorporate a double locking system, and hold 25 and 50 disks. Priced at £5.80, £25 and £35 respectively, the files are transparent low-static, smoke coloured material and include index dividers. For easy retrieval, the disks are presented vertically when the boxes are opened.

Contacts: ISA Gold, 80/84 Thornton Road, Bradford, West Yorkshire. Tel: 0274 306787.

ACS, Bowmaker House, Etruria Road, Hanley, Stoke-on-Trent. Tel: 0782 287121.

Budgetting and banking

Adventure game specialists, Richard Shepherd Software are entering the business market with the launch of the 64 Cash Controller.

Available on cassette (£9.95) and disk (£14.95), the program caters with three important areas of money management.

A bank account section allows for the storage of 400 transactions including standing orders.

An integrated budget section caters for sixteen budget headings, and expenditure is automatically coded through from the bank account section.

A loan and mortgage calculator calculates principal sum, rate of interest, period of loan or repayment details on the basis of the other three factors.

Data can be saved and is secured by the allocation of a password for each data file created.

The program is compatible with the Commodore MP 801 and 1526 printers and has facilities to provide printouts of statements, budgets, etc.

Contact: Richard Shepherd Software, Elm House, 23/25 Elmshott Lane, Cippenham, Slough, Berks. Tel: 06286 63531.

Adaptors

Letco, pioneers of the 64K memory expander for the VIC 20, have produced an adaptor (model 64KVA) to use with their 64KV memory expander on the 64.

When used on the 64, the addresses from $8000 to $9FFF will have eight separate blocks of 8K locations, each block selected by a single POKE instruction.

The adaptor costs $29.95 and the combination for use on the 64 costs $139.95.

Contact: Letco, 7310 Wells Road, Plain City, Ohio 43064.

Robot George

While not strictly a Commodore product, George the programmable robot will appeal to many computer enthusiasts.

Retailing at £23.95, George is a 16.8cm high robot with 48 programmable steps. He has three selectable gears and nine time intervals. George also emits a light beam and robot-like sound, and has a demo program to show off everything he can do.

Dressed fetchingly in grey, red and blue, George is more than just a toy, providing all the fundamental features of an expensive teaching system. Fully self-contained, he has an in-built microprocessor controller. Functions are programmed by a small keyboard on top of his 'head'. Traction and steering are provided by dual motors which drive rubber-tyred wheels and a built-in speaker and light, operated under control of the microcomputer.

George is suitable for children aged four upwards.

Contact: CGL, CGL House, Golding Hill, Loughton, Essex. Tel: 01-508 5600.

Megarule rules

The Megarule is a perspex magnifying ruler which makes the reading of computer listings very much easier. Placed over the text, it magnifies over 100% and in the centre is a guide line for accuracy.

Available clear or slightly tinted, the Megarule costs £2.99.

Contact: Dealer Deals, 20 Orange Street, London WC2. Tel: 01-930 1612.

Shaping up

Hewson Consultants have secured a contract from the Longman publishing group to supply an exercise planning program.

Called Shaping Up, the program was designed for use with the 64 and features an on-screen demonstration of exercises tailored to the individual user's requirements.

Shaping Up is being marketed in conjunction with the magazine, Successful Slimming.

Contact: Hewson Consultants, 56B Milton Trading Estate, Milton, Abingdon, Oxon.

New idea

'The Practical Guide for People with a New Idea' explains how to protect a new idea, product or scheme and exploit it to the full.

Areas covered in the book include market research, approaching a manufacturer, telling the world about an idea without losing your rights, patenting an invention, secret patents, checking an idea is original, patent cost and life span. Also information about copyrights, designs, trademarks and licences.

It costs £5.95.

Contact: The Patent Eye, George House, George Road, Edgbaston, Birmingham.

PRODUCT NEWS

Colours

Fashion conscious micro owners can now buy a colour monitor in a livery to match their computers.

A range of colour cabinets has been launched by Compuser for their medium resolution monitor, the Professional 2000, Commodore's colours being two-tone grey. The monitor features a black face anti-reflection faceplate. It has RGB linear input and is also available in RGB/TTI.

The retail price is £325.

Contact: Compuser, 27 Vulcan Way, New Addington, Croydon, Surrey. Tel: 0689 46116.

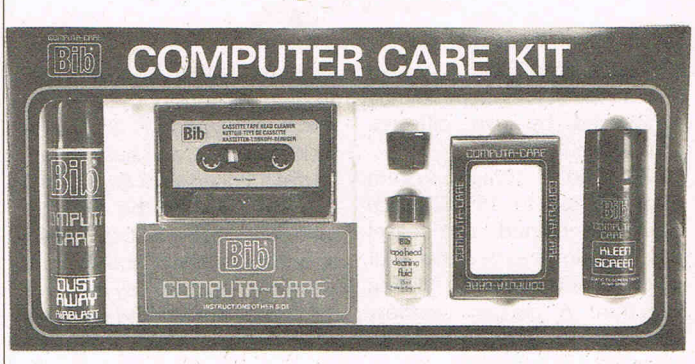
Brochure

All you ever wanted to know about word processing but were afraid to ask can now be discovered in a free illustrated eight-page brochure published by Dataview Wordcraft.

Focusing on Wordcraft software, the brochure explains what word processing does, hardware and software, how it can save or make money, and how it makes life easier for the user.

Contact: Dataview Wordcraft, Radix House, East Street, Colchester, Essex. Tel: 0206 869914.

Clean up



A range of computer care products from Memorex includes: VDU and TV screen cleaning kit comprising cleaning tissues and two anti-static cloths, at £4.95; case and keyboard cleaning kit, also at £4.95, comprising aerosol spray foam, cleaning cloth and cotton buds; disk drive and head cleaning kit with 10 disposable head cleaners and aerosol spray cleaner for wet and dry action, costing £9.95; and a storage case of 5.25 inch floppy disks, costing £2.25.

Bib have also produced a Computer Care Kit comprising Audio cassette head cleaner with cleaning fluid, air duster for cleaning dust and dirt away from keyboard and printer, together with anti-static screen cleaning fluid with cleaning. The kit costs £8.74.

Contacts: Memorex, Memorex House, 96/104 Church Street, Staines, Middx. Tel: 0784 51488.

Bib, Kelsey House, Wood Lane End, Hemel Hempstead, Herts. Tel: 0442 61291.

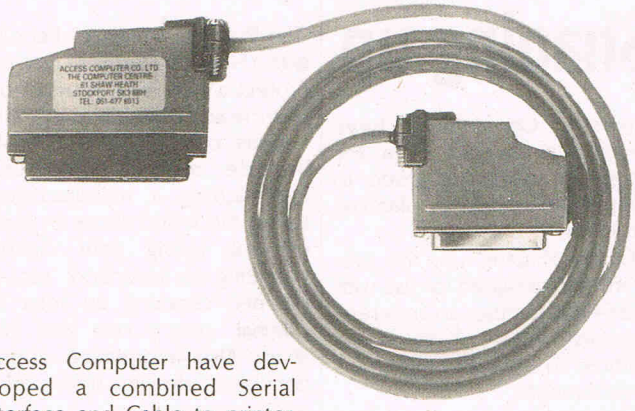
Triptych

Each title in Triptych's Brainpower range contains an educational book and program, together with a practical applications program.

Five titles are available for the 64: Entrepreneur, Numbers At Work, Decision Maker, Project Planner and Forecaster. Cassette and disk versions are available for each title at £14.95 and £24.95 respectively.

Contact: Triptych Publishing, Sterling House, Station Road, Gerrards Cross, Buckinghamshire. Tel: 0753 889988.

Interface Adapter



Access Computer have developed a combined Serial Interface and Cable to printer. Designed for use with most RS232 Serial printers, the unit is supplied with simple instructions and is available by mail order for £34.95.

Contact: Access Computer Company, The Computer Centre, 61 Shaw Heath, Stockport, Cheshire. Tel: 061 477 6013.

Light pen

A light pen package for the 64 is now available from Stack Computer Services. Costing £28, it comprises a light pen, a comprehensive user manual, two demonstration cassettes containing nine games, and Stack's new paintbox draw software.

Stack's new dustcovers comply with anti-static and fire resistant regulations with costs varying from £1.50 to £5 according to machine size.

Also new from Stack are three basic compilers for the 64. These vary from £14.95 on cassette to a security key version at £39.95.

Contact: Stack Computer Services, 290/298 Derby Road, Liverpool. Tel: 051 933 5511.

Lightning strikes!

Oasis Software have launched three 64 games writing utilities, all available on disk and cassette.

Basic Lightning is an extended BASIC with more than 200 extra keywords. A cassette version costs £14.95 and the disk, £24.95. White Lightning (cassette £19.95, disk £29.95) includes the BASIC Lightning package and produces very fast stand alone machine code programs.

Machine Lightning (cassette £29.95, disk £39.95) is a Macro Assembler/Monitor.

Contact: Oasis Software, Alexandra Parade, Weston-Super-Mare, Avon. Tel: 0934 419921.

Drive faster!

There's nothing worse than waiting for your program to load. And good though the Commodore 1541 is, speed isn't exactly its biggest feature.

Hook up the new 1541 Express from RAM, though, and you'll be up and running like lightning.

This ingenious add-on speeds up data transfer from the 1541 and new 1542 disk drives to your Commodore 64. So much so, that you'll wonder how you ever found the patience to wait before.

With the Express you can load programs in a third of the normal time. That means less frustration and less time wasted.

(You can fit it yourself in minutes, too – and disconnect it just as easily).

The new 1541 Express from RAM.

To shift your drive into top gear call into your nearest dealer today.

Or call our credit card hot line on 02514 25252. (Access and Visa welcome).

Or complete the coupon below and send it today to: Dept CCI, Ram Electronics (Fleet) Ltd, 106 Fleet Road, Fleet, Hampshire, GU13 8PA.

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To: Dept CCI Ram Electronics (Fleet) Ltd, 106 Fleet Road, Fleet, Hampshire GU13 8PA.

Trade and export enquiries welcome.

Package deal from CBM

Commodore's 8296D is now being sold complete with over £865 worth of software.

This software comprises three packages: SuperScript, a word processing package including Spelling Checker; The Manager, a comprehensive database and file management package; and Calc Result, a financial planning spreadsheet.

"No other machine in the price bracket offers as much floppy disk storage capacity as the 8296D," says Mark Horne, Commodore UK Business systems product manager. "When coupled with free applications software, we believe the machine offers unbeatable value for money."

The 8296D offers 128K memory, high resolution graphics with 80-column 25-row green-phosphor integral screen, four screen page-switching and compatibility with a range of printers – from a 60 cps dot-matrix printer to a 40 cps letter-quality printer. Using Basic 4.0, the 8296 range have a detachable, full-size Qwerty keyboard with separate numeric keypad. Styling includes swivel/tilt on the monitor and programs can optionally display information in high resolution.

The entire package is sold for £1,690 (excluding VAT) and includes the 8296D with integral 2 Mbyte floppy disk drive, 128K RAM, monitor, keyboard and wordprocessing, financial planning and database software.

Contact: Commodore, 1 Hunters Lane, Weldon, Corby, N. Hants. Tel: 0536 205555.

Audiogenic

Audiogenic have launched the Professional Range of business software for the 64. Supplied on disk, the three packages cover all business applications.

Wordcraft, at £24.95, is a disk version of the Wordcraft word processing system for the CBM Business range of computers. Swift is a spreadsheet facility retailing at £19.95. It provides features normally associated with expensive, desk-top micro packages.

Magpie, at £39.95 is a data base system. A range of modules, each costing £14.95, is also available covering areas such as sale account, mail lists and invoicing.

Contact: Audiogenic, 39 Sutton Industrial Park, London Road, Reading, Berks. Tel: 0734 664646.

Good news!

Bubble Bus Software have taken over the marketing of business products from their offshoot, the Computer Room.

Supernews, a delivery and accounting system for newsagents is the first package to be marketed. This Commodore approved product is available for the 64 and 8000 series and costs £499 (excluding VAT).

It caters for up to 3000 deliveries, produces rounds lists, accounts, and pre-order requirements.

Contact: Bubble Bus Software, 87 High Street, Tonbridge, Kent. Tel: 0732 355962.

Ledger

Kemp have launched Purchase Ledger for the 64. A ledger accounting program for recording and analysing purchases, Purchase Ledger is menu-driven and costs £27.95 for the cassette version and £29.95 on disk.

Up to 100 creditor accounts and 50 nominal accounts are catered for and the program has a full range of print-out. It can be used with Centronics interfaces and comes complete with a 16-page manual.

Contact: Kemp Ltd, 43 Muswell Hill, London N10. Tel: 01-444 5499.

Software directory

Over 5,000 software packages are contained in the latest edition of Microcomputer Software Directory.

Business management software has been one of the largest growth areas over the last nine months, showing an increase of 130% over the 1983 Directory. The number of business and commercial packages available in the UK, including word processing and integrated business systems, grew by 108% over the year with there now being some 400 packages in this category.

In addition to business applications, the Directory addresses a further two fast-growing sectors of the microcomputer software industry – education and games.

The Microcomputer Software Directory costs £40 plus £2.20 p&p.

Contact: Computing Publications, Evelyn House, 62 Oxford Street, London W1. Tel: 01-323 3211.

Unisoft

Unistat is a statistical package for the 64 from Unisoft. Features include Multivariate regression; analysis of variance, scatter diagrams and time series plots; statistical tests, correlation coefficients and probability distributions; descriptive statistics, frequency distributions and histograms.

Available on disk or cassette, Unistat costs £85.

Also available from Unisoft is Unimax, a linear programming package capable of handling all sorts of linear programming problems. Matrix operations include inversion, transposition, determinant, pre and post-multiplication, scalar multiplication, addition and subtraction of matrices and vectors. Matrices can be saved and loaded at any stage.

Available on disk or cassette, Unimax costs £60.

Contact: University Software, Dept C, St Peter's Street, London N1. Tel: 01-359 0978.

Computer trolley

In adition to a standard range of tray sizes, Bulldog Computer Services are offering VDU trolleys which can be custom built to suit any size and make of computer.

Supplied with a length of flexible conduit and fixing clamp to ensure that the interface and power cables are kept together, each unit is equipped with lockable castors.

Bulldog trolleys are available on 30 days approval.

EME offer a choice of trolleys with two shelf levels. Model 2225/Primary with an overal height of 842mm and a lower shelf height of 610mm costs £54.95 (plus VAT). Model 222/Secondary, at £56.95 (plus VAT), has an overall height of 892mm and lower shelf height of 660mm.

Finally, Servicon Dynamics have developed a stand which gives the illusion that the monitor is floating. The stand utilises a counter balance system allowing the fulcrum for the swivel/tilt mechanism to be positioned at the rear of the monitor. The user positions the monitor at the required angle and direction and it stays there.

Contacts: Bulldog Computer Services, 33 Hinkley Road, Sapcote, Leicester. Tel: 045527 2329 (or enquiry Hotline – 045527 4575).

EME, 70 West End Road, High Wycombe, Bucks. Tel: 0494 26508.

Servicon Dynamics, 186/190 Cirencester Road, Charlton Kings, Cheltenham, Glos. Tel: 0242 528213.

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- the sophisticated spreadsheet !

Easy to learn, easy to use - something that can't be said of many business programs. But it's true of all the programs in the BUSICALC series.

BUSICALC 3 can handle all sorts of jobs - budgets, expenditure analysis, stock lists, price lists, and product costing are just a few of the possibilities. Three-dimensional formulae automatically access data stored on disk, so that you can easily pull together information from several different sheets and summarise or manipulate it.

It's simple to transfer data to other programs such as Easy Script. And you can use virtually any printer with BUSICALC 3, whether dot matrix or daisy wheel, Commodore or non-Commodore.

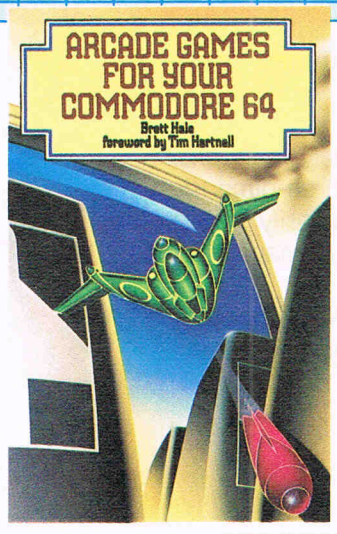
For the CBM 64 and PET/CBM 4000 & 8000 series.

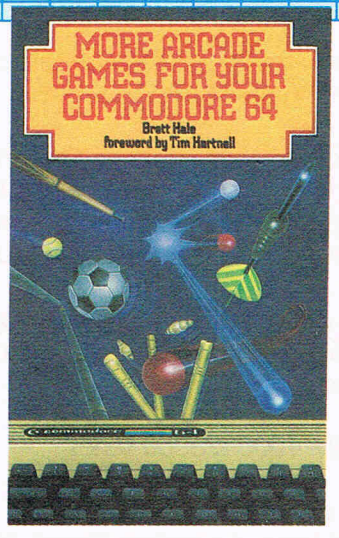
Available through dealers or from:
Supersoft, Winchester House, Canning Road, Harrow HA3 7SJ

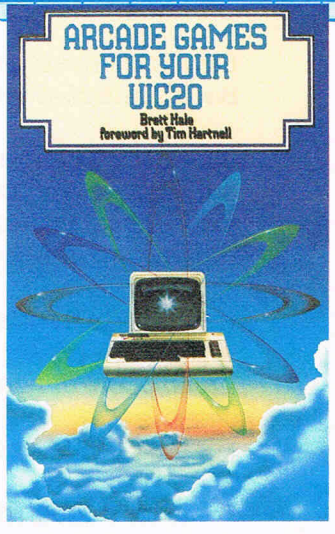
Phone 01-861 1166 for more details and a free catalogue.

STOP!

YOU OWN A COMMODORE 64 OR VIC 20, BUT ARE YOU MAKING THE MOST OF IT?







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Each one is packed with a stunning array of arcade games, enabling you to explore the full power and potential of your micro.

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* Each one is listed twice – once for keyboard use, and once for use with a joystick

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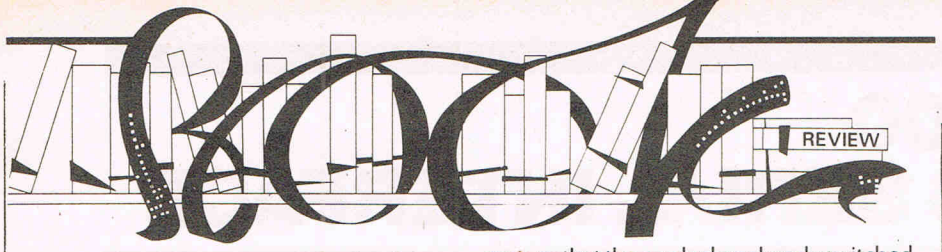

THE REALLY EASY GUIDE TO HOME COMPUTING — COMMODORE 64

Now here's a book that really lives up to its title. Aimed at the complete beginner, it's a large format book packed with cartoons illustrating almost every move you make. The 'Magic Micros' Mike and Rose guide the reader through his or her introduction to all the concepts central to programming in BASIC on the 64. Extra guidance to the positioning of keys is provided by Inspector Key and his dogs!

Two mothers, Sue Beasley and Ruth Clark, are the authors of this book and they manage to capture the attention of the youngest reader in a way that will also amuse and interest older readers.

It is a book to be read from the start to finish rather than a reference guide to be dipped into, with each chapter offering 'extra things to do'.

With the aid of Mike and Rose, the reader soon learns how to use all the facilities of the keyboard, how to create a program and make it work, together with editing, program control, simple loops and numeric variables, and how to understand syntax errors and report codes. In addition to this, instruction is given on how to control the placing of text and pictures on the screen, how to use colour and movement and how to produce sound effects.

At £7.95, The Really Easy Guide To Home Computing is a clear and concise introduction to your 64.

Contact: Century Publications, Portland House, 12-13 Greek Street, London W1.

GATEWAY TO COMPUTING WITH THE COMMODORE 64

"Learning is fun" is the message put across by many computing books aimed at the first-time user. Ian Stewart's Gateway to Computing enforces this idea with programs concerning colourful characters such as Carlton Q Cashsnitcher, the Gnatwest Bankager and Ivan Nokyablokov, spy with a mission. Not to mention his groan a minute humour and the resurrection of ancient jokes such as "Do you know the difference between an elephant and a letterbox?". However, all this is relevant to the book's aim to introduce the reader to the fundamentals of computing.

Most introductory computer books assume that the reader has already switched on the computer. Ian Stewart assumes total ignorance, explaining how to set up a computer and advising a suitable and comfortable layout of equipment.

After 'making friends with your computer' consecutive chapters lead the reader further into the world of BASIC programming. Diagrams, cartoons and listings reinforce and illustrate the text throughout the book.

Towards the end of the books, the author explains in more detail how the computer works and also provides a glossary of terms and a commands and symbols index.

The only fault some parents might find the Gateway to Computing (which retails at £4.95) is that it may enforce such phrases as 'get stuffed' and 'no sweat' into a child's vocabulary!

Contact: Shiva Publishing, 64 Welsh Row, Nantwich, Cheshire CW5 5BR.

KIDS AND THE COMMODORE 64

Only an American book could begin with a list of acknowledgements filling a whole page. Even Aunt Mildred and Rover the dog get a mention (well almost!)

Written by Edward H Carison of Michigan State University, Kids and the Commodore 64 is extremely reminiscent of a school text book despite the use of cartoon illustration.

Although intended for home study, each chapter contains notes for the teacher and questions to ask the class. The reader is also tested on what has just been read with space left to fill in answers.

At some points of the book, particularly at the very beginning, a programming concept is thrown in without any explanation. For Example: before programming is even mentioned, the reader is advised to POKE 53281,0 to get a black screen. The result will be achieved, but the reader won't know how or why this has happened. Another grumble, which is probably purely personal, is that some of the text made me cringe. A couple of examples: "...the computer may get sick and you will have to turn it off, then on, to make it well." "The flashing cursor is like the computer snoring." Yuk! At the pricely sum of £19.95, it is arguable whether the reader benefits more from the 'school book' approach than from the 'learning is fun' end of the market. It's probably a matter of taste, but I'm sure most beginners would choose to steer clear of anything reminiscent of school.

Contact: Prentice/Hall International, 66 Wood Lane End, Hemel Hempstead, Herts.

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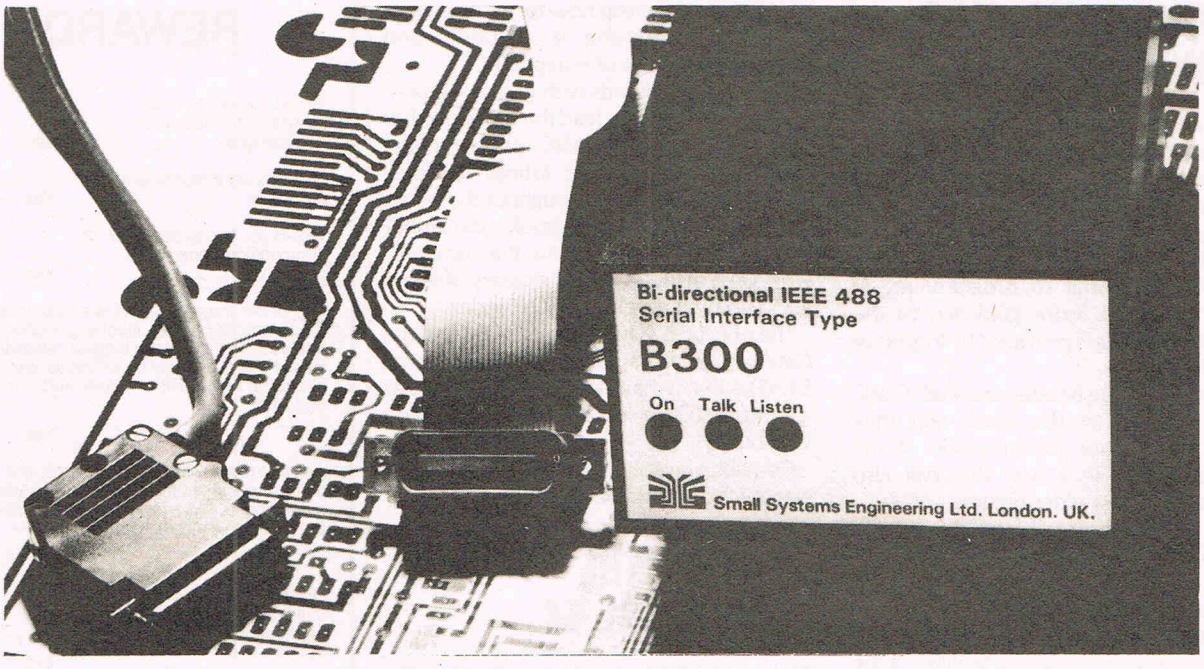
TYPE B300
IEEE-488 SERIAL INTERFACE



The B300 interface is a bidirectional unit which enables IEEE-488 controllers to communicate with serial devices such as KSR terminals, modems, laboratory instruments and other computer systems.
The B300 replaces the SSE type B and B200 bidirectional interfaces. It is fully compatible with both earlier units in that it incorporates both software selectable and switch selectable Baud rate control. This flexibility has been achieved by designing the unit around an 8748 single chip microprocessor. The 8784 also provides a 40 character input buffer which provides flexibility in handling high speed data input.

Specification
IEEE-488 functions: Source Handshake (SH), Acceptor Handshake (AH), Talker (T), Listener (L) and Extended Listener (LE).

Switch selectable options
Parity—ODD/EVEN
Parity—Enable/Disable
Baud Rates—110, 300, 1200, 9600
Talk Addresses—4, 5, 6, 7
Listen addresses—4, 5, 6, 7
Code Conversion—Mode A/B
No. of Data Bits—7/8

Software selectable options
Baud Rate selection using a secondary listen address followed by a configuring byte which sets input baud rates. 16 different baud rates in the range 50-19,200 baud can be selected. Input and output baud rates can be set to different values.

RS232C signals
Transmitted Data, Receive Data, Request to Send, Clear to Send, Data Terminal Ready.

Connectors
IEEE-488 lead—24 way male ribbon connector.
Female 24 way ribbon and an edge connector to fit PETs IEEE port supplied as options.
RS232 lead—25 way D-Type connector (male or female).

Packaging
The B300 is housed in a small instrument case with integral power suppies. ON, LISTEN and Talk indicators are provided on the front panel.

Options
20mA opto-isolated current loop adapter mounted in a D-type connector shell which provides active or passive current loop 10.
Communications PROM—designed to optimise the B300's performance with the INTERCOMM general purpose asynchronous communications package.

Warranty
90 days against defective workmanship or component failure under normal operating conditions.

Prices
B300..... £186.00
Current Loop Adaptor £25.00

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Adventurers aid

Programmer Duncan Gamble looks at four recently-released packages including The Quill, an adventure writing package from Gilsoft.

THE QUILL

"an excellent utility"

The Quill is effectively a database within the framework of which the user enters data and conditions which combine to produce an adventure game. The final runtime code is separable from the compiler and manufacturers Gilsoft make it known that the runtime code can be used, with a statement of acknowledgement to the quill, by adventure writers for their own games for sale. A measure of how successful this has been can be gained from the number of adventures now available written under The Quill.

The Quill allows good adventure creators who are not good programmers to exploit their skills without being handicapped by having to write a Basic or Machine code program with which to express their creations. The adventure must first be thought up, with maps, objects and problems. This is then entered in the editor by location or by object number. Text and replies to inputs must be entered as must conditions for events. To control the flow of the adventure, 32 flags are available. 1-10 are predefined by the interpreter for the usual requirements of an adventure – whether it's dark, how many times a command is entered, how many times a location description is used. Some flags depend on whether object number 0 is present or absent. This object can be used for a torch or lamp as some other flags depend on whether it is dark or not and whether this object is present.

The manual is informative and concise – for such a powerful package it is of needs quite lengthy but is well structured and includes appendices of error messages generated by the editor and interpreter and a list of quill commands.

The quill language itself is very simple but adequate for describing adventures. The manual contains several example routines showing implementation of such usual adventure features as hunger and opening locked doors. Some words are predefined by the interpreter such as load, save, end. These are needed by all adventures so to save space they are in the run-time system itself. For adventures with a random element Chance produces a number between 1 and 100.

The Spectrum origins of the Quill are shown in Ink, Paper and Border colour commands. If sound is required a SID command pokes a register number with a value, this is enough to make purists rattle their spears and bang their shields in distaste, but sound can convey an atmosphere as much as any text.

Do not expect to write adventures as sophisticated as Lords of Time or the Hobbit, but adventures far better than many of those on the market now can be produced with this excellent utility.

Contact: Gilsoft, 30 Hawthorn Road, Barry, S Glamorgan. Tel: 0446 732 765.

THE COMPLETE MACHINE CODE TUTOR

"results can be spectacular"

6502 Machine code is not the easiest computer language to master, but it is worth

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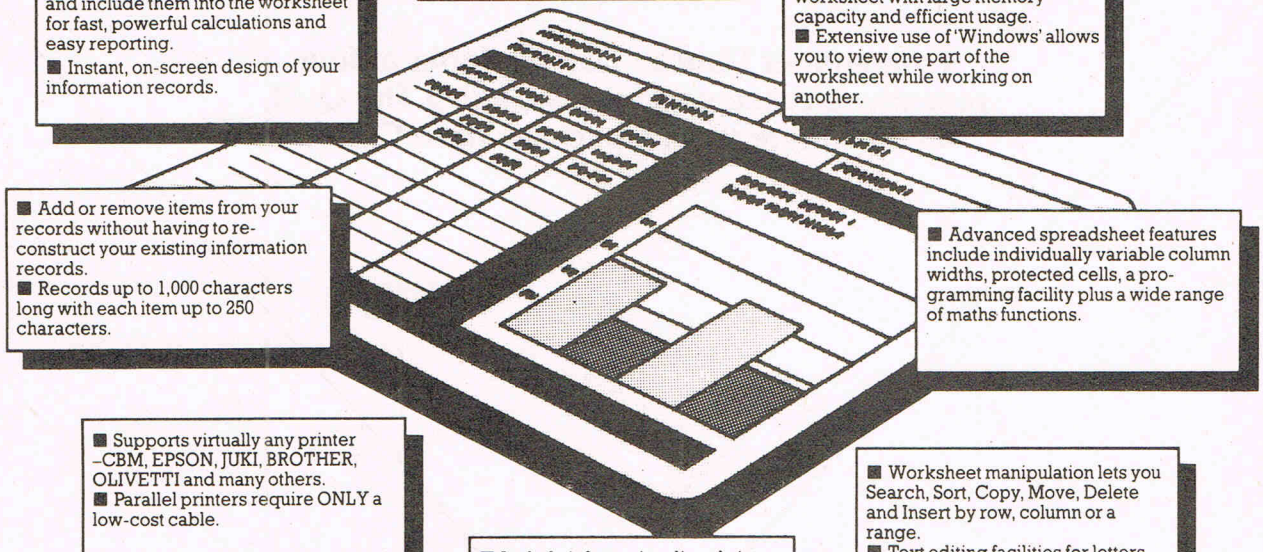

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the trouble as the results can be spectacular – witness the amazine games available for the '64.

Programming in machine code gives the programmer access to speeds of execution for his programs which could not be contemplated in Basic. The complete machine code tutor consists of 23 lessons with associated examples of programming and exercises. An assembler emulator is included which allows the user to run his programs without fear of the machine hanging as it is wont to do in real machine code.

The user is taken step by step through the registers, memory and then some actual instructions. The booklet and the on-screen tutor complement each other well, the user need only move on when he is sure that he understands all taught so far. Any section can be recapped from the menu of lessons which appears on the screen when any lesson or exercise is completed or when an exercise is interrupted.

The first lesson is entitled 'Registers' and consists of only a page of text – most lessons are much longer than this. Lesson two teaches about memory: what do those sacred words RAM and ROM mean. After the third lesson, which is about loading and storing registers, comes the first exercise. Exercise one shows use of LDA and STA in a very short assembly language (assembly language is machine language in a more readable form) program running under the simulator. The status of the flags and the contents of each of the registers is shown for each instruction as it is executed. The flags are then discussed and simple arithmetic follows.

The Complete Machine Code Tutor manages to get over concepts such as registers and flags without resorting to being condescending or treating the reader like a moron. Explanations are concise and well worded and do not repeat themselves unnecessarily.

Topics covered include the use of different addressing modes to access different types of data, comparing data and conditional branching. Binary coded decimal and its uses are explained, and other mathematical instructions and techniques are also covered fully.

The Complete Machine Code Tutor takes the reader up to such concepts as stack manipulation and interrupts. Beyond this point the reader should have the confidence to 'go it alone'.

A package of this type can instruct the reader on actual 6502 Instructions and how to use them. To program effectively the reader must still then practice and practice to appreciate the techniques behind machine code programming.

Contact: Anirog, 29 West Hill, Dartford, Kent. Tel: 0322 92513.

PILOT-PLUS/64

"would suit the programming beginner"

Pilot is a language used for computer assisted learning (CAL). It is a very simple language, sometimes sited as the ideal beginners language. Pilot-Plus/64 conforms to the language base specifications as set down by Western Washington University, but has been expanded to make use of the 64's graphics and sound capabilities and also can be interfaced to Basic.

Pilot-Plus/64 commands are all one or two letters, this makes Pilot-Plus/64 programs less readable than Basic, but due to the lesser number of commands to learn, one becomes accustomed to reading and understanding Pilot listings very quickly.

Pilot-Plus/64 comes with a powerful screen editor with bi-directional scrolling, search and replace and renumber commands included. Pilot-Plus/64 line numbers are insignificant within the language as labels are used – they appear only for convenience while editing. The editor section of the manual is well explained and easy to read, but when one starts reading about the language itself one is immediately confronted by 'A line of Pilot-Plus/64 can be up to 80 characters long and consists of a line number from 1 to 63999...', O.K. so far; '..followed by an optional label or a * followed by up to six characters, followed by an op-code, followed optionally by one or more modifiers and/or conditionals, followed by a colon, followed optionally by a line of text'; phew!

Pilot-Plus/64 provides for quite advanced screen handling with commands to position the cursor, set graphics or no-graphics character set and scroll the screen.

Sound has not been forgotten with a sound effect command with time, frequency and an attribute defining voice and waveform parameters. Printers are handled by hard copy versions of pilots printing commands – only Commodore printers through the serial port are supported, so interfacing other printers could be tricky.

Pilot is based around a question and answer system with structures for several attempts at a problem, with different messages on different attempts. Input is accepted from the keyboard and then matched to an answer or set of answers, conditionals ('if..then' type statements) then direct program flow depending on correct or incorrect input.

Typical Pilot usage would be for teaching lists of information, or shape recognition. Pilot-Plus/64's Basic interface is used for those jobs Pilot cannot handle such as files and also as an intermediary to machine code routines.

Pilot-Plus/64 seems well implemented and would suit the programming beginner but for the verbose and unnecessarily complicated manual. For most other purposes Pilot is too simple a language to produce more powerful programs.

Contact: New Generation Software, The Brooklands, 15 Sunnybank, Lyncombe Vale, Bath. Tel: 0225 316924.

PULSE ASSEMBLER

"difficult to recommend"

Pulse is Interceptor's second assembler for the 64, and is an extension of their first assembler. Written in compiled basic, which does slow down assembly speed quite considerably, Pulse is not directly source code compatible with other assemblers on the market for the 64. Listings retyped from other assemblers or from magazines will require some work to convert them to Pulse format.

The major differences are semi-colons being used instead of commas for indexed addressing and delimiters in BYT instructions. A far more crucial difference is the limiting of labels to two characters! Anyone who can write meaningful two letter labels will not find this too much of a disadvantage but for the rest of us this does not help in producing readable source code. Pulse allows branches to labels or to linenumbers. A limited form of expression evaluation is available but allows only addition.

With Pulse only 11k is available for source code, and there are no linking instructions to allow longer programs. This limits severely the size of program that can be assembled.

For disk users commands have been added to display the disk directory on screen without losing the source program, and for initialising and validating disks, it is also possible to read the disk error channel.

Most 6502 conventions are followed apart from those described above, < and > for low and high byte and # for immediate addressing are implemented. As Pulse can work only in decimal, the $ and % signs for hexadecimal and binary are discarded. Comments are preceded by three asterisks.

Auto line-numbering, renumbering and block delete commands are available, as is listing to a printer. Typing 'commands' gives a summary of Pulse commands.

Pulse is one of the cheapest assemblers on the market, but it is still difficult to recommend it to anyone who intends to use an assembler for more than an occasional short machine code routine.

Contact: Interceptor, Lindon House, The Green, Tadley, Basingstoke, Hants. Tel: 07356 71145.

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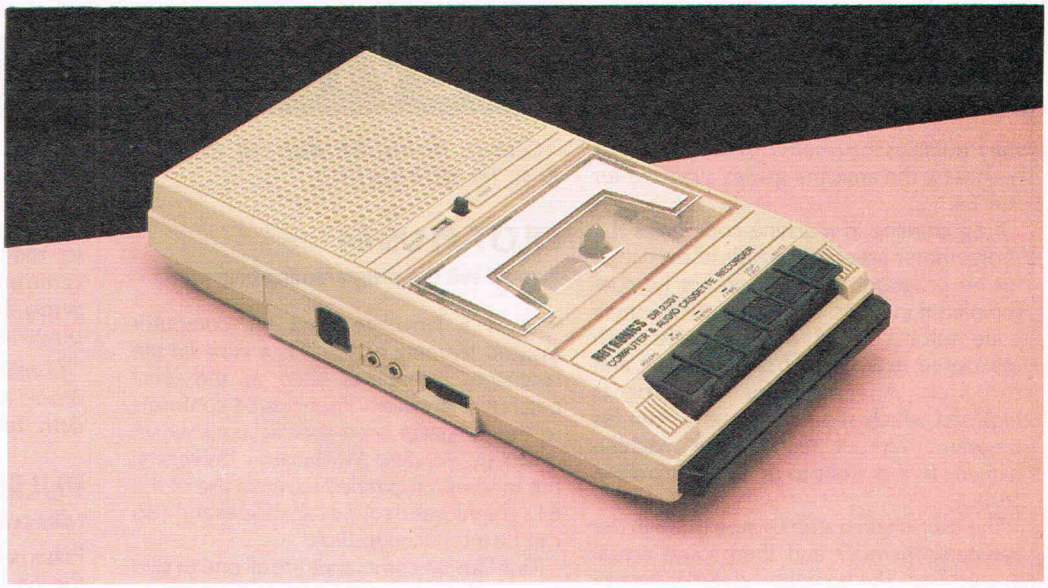

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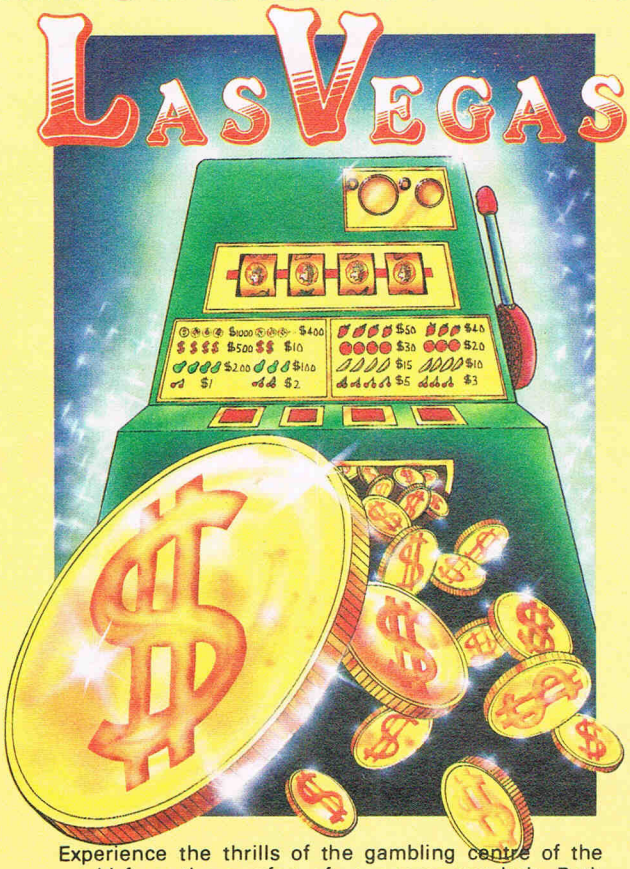

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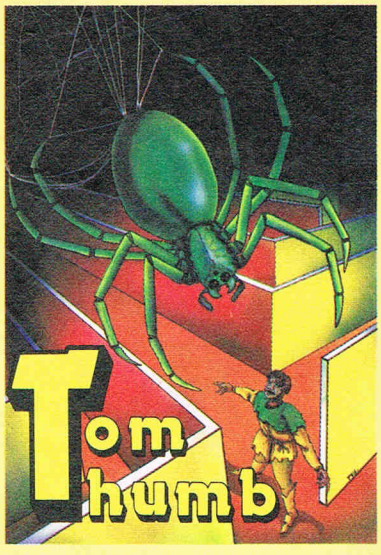

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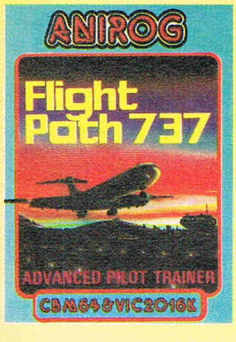

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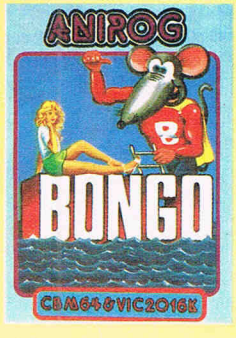

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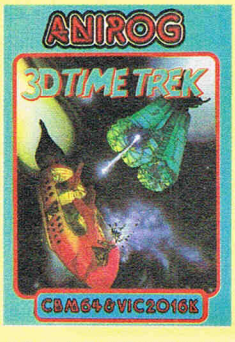

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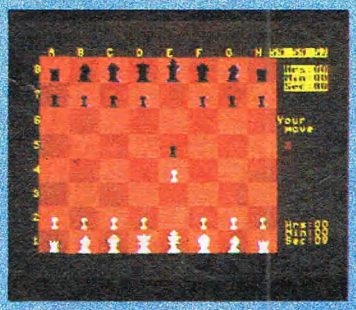

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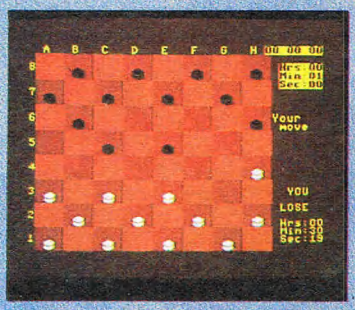

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